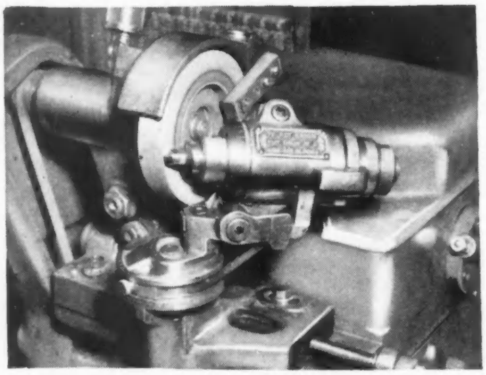
25TH ANNUAL STATISTICAL ISSUE

AUTOMOTIVE and Aviation INDUSTRIES

MARCH 15, 1943

TO GET MAXIMUM TOOL LIFE
PLUS PRODUCTION -- ACCURACY -- FINISH
FROM YOUR BORE-MATIC TOOLS

GRIND TOOLS THIS WAY | **NOT THIS WAY**

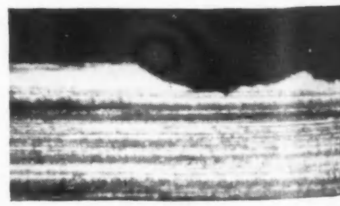


Your single point carbide tools can be quickly lapped exactly to required specifications on the Heald Tool Sharpener — make a few simple adjustments, flick a switch and your tool is correctly lapped, automatically.

The personal element is bound to be reflected in tools ground free hand. Exact tool shapes are impossible to produce. Undesirable irregularities in the cutting edge cannot be avoided.

Free hand grinding of single-point cemented carbide tools will cut short tool life — and lower production, too. By correctly lapping carbide tools on the Heald Tool Sharpener tool life can be greatly increased since a lapped edge is keener, cuts longer, doesn't break down as fast as a ground edge . . . valuable tool material is conserved because more pieces are produced per sharpening, less material is lost in sharpening . . . better accuracy and finish are obtained as a result of the lapped edge cutting more smoothly, holding its contour longer . . . production is boosted because time lost in resharpening and replacing tools is measurably reduced. Such results cannot be obtained by grinding tools free hand — they must be mechanically lapped on a diamond wheel. Only by positively controlled diamond lapping can absolute regularity of cutting edge and exact nose radii, rake, shear and clearance angles be consistently reproduced. The Heald Tool Sharpener is designed to sharpen tools this way — quickly and inexpensively. Complete details gladly sent on request.

Photomicrograph of tool point lapped w fine grit diamond wheel on Heald T Sharpener. Magnification 100X. Note absolute regularity of cutting edge. T means longer tool life, better finish and curacy, increased production.



Photomicrograph of tool point ground free hand with fine abrasive wheel. Magnification 100X. Irregularities in cutting edge result in localized stress concentration, the breakdown of the cutting edge and rapid wear.

THE HEALD MACHINE CO. WORCESTER MASS. U. S. A.

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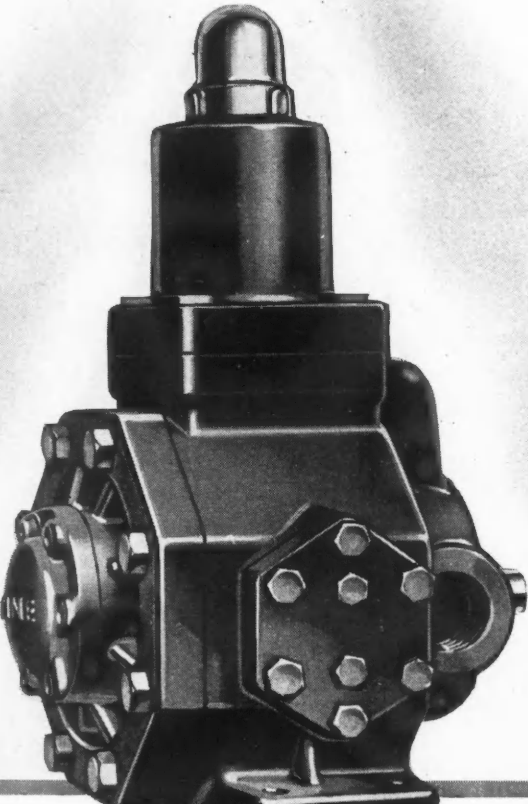


RACINE

Variable Volume

HYDRAULIC PUMPS

A Modern Source of Hydraulic Force

With EXCLUSIVE "Vane Type VARIABLE VOLUME" FEATURE for vibrationless performance in modern machine design. Designed for long life, efficient low cost operation, these pumps are the latest "Source of Force" for metal working and industrial machinery—for clamping, forming, moulding, forcing, feeding, straightening, bending, lifting, holding and numerous other operations.

Delivery of Pump is varied by changing the position of the "True Circle" pressure ring to the rotor—pumps only the amount of oil you need to do the job—no relief valve required. Racine tilted Vane Rotor design prevents gouging of chamber ring. Vanes tend to polish the surface and cannot seize.

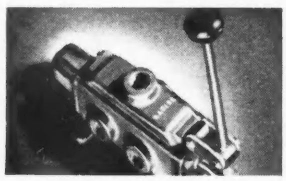
Because the flow of oil is automatically varied, Racine Pumps operate at reduced horsepower. Momentary shock loads are avoided, hydraulic hammering and oil heating are reduced at constant operating pressures from 50 to 1000 lbs. per sq. in.

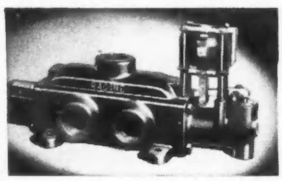
Racine Oil Hydraulic Pumps are made in three sizes—0-12, 20 and 30 gal. per min. capacity at 50 to 1000 lbs. pressure per sq. in.

Equipped with standard automatic pressure controls; or with Solenoid, Lever or Hydraulic two pressure control; or with handwheel or lever for manual volume control.

RACINE OIL HYDRAULIC VALVES

With Balanced Piston—"Sleeve Type" Construction





Exclusive honed alloy "Sleeve Type" construction provides a continuous bearing and sealing surface—piston always in alignment, cannot sag.

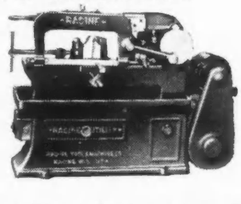
These Racine Four-Way Oil Hydraulic Valves are available in 3/8" to 1½" standard pipe sizes with mechanical, electrical or manual operating device. Various porting arrangements can also be furnished to suit your requirements.

Racine makes available to all Tool Engineers and Designers a complete service for your oil hydraulic problems. For complete information, address Dept. AA-P.

RACINE HYDRAULIC METAL CUTTING MACHINES

The Production Saws of Modern Industry

Racine's Metal Cutting Machine line is complete for either general purpose or production cutting—Wet and Dry Cut Models. Hydraulically fed and controlled to produce fast, accurate and efficient metal cutting. Capacities 6" x 6" to 20" x 20".



RACINE TOOL and MACHINE COMPANY

STANDARD FOR QUALITY AND PRECISION

RACINE, WISCONSIN • U. S. A.

IN THIS ISSUE . . . .

AUTOMOTIVE
and AVIATION
INDUSTRIES

Volume 88 March 15, 1943 Number 6

AUTOMOTIVE INDUSTRIES
Reg. U. S. Pat. Off.

WAR PRODUCTION

MAN POWER

MATERIALS

Statistical Data

GENERAL INDUSTRIAL

AUTOMOTIVE AND AVIATION

SPECIFICATIONS

RYERSON *Immediate* STEEL

United States Troops Advancing on Oran. Photo by U. S. Army Signal Corps.

Helps Make Record Delivery to *AFRICAN FRONT*

BACKING up our fast-moving mechanized Army takes fast-moving production—swift action that starts the minute the order is given, that never sleeps, and that turns out jobs in days, which normally would take weeks to do.

Certain equipment already ashore in North Africa required important alterations to meet unusual battle conditions. The North Africa command said: "RUSH"! The Ordnance Department said: "RUSH"! The Ryerson customer who got the order said: "RUSH"! —and fifty tons of steel were immediately forthcoming from a nearby Ryerson stock.

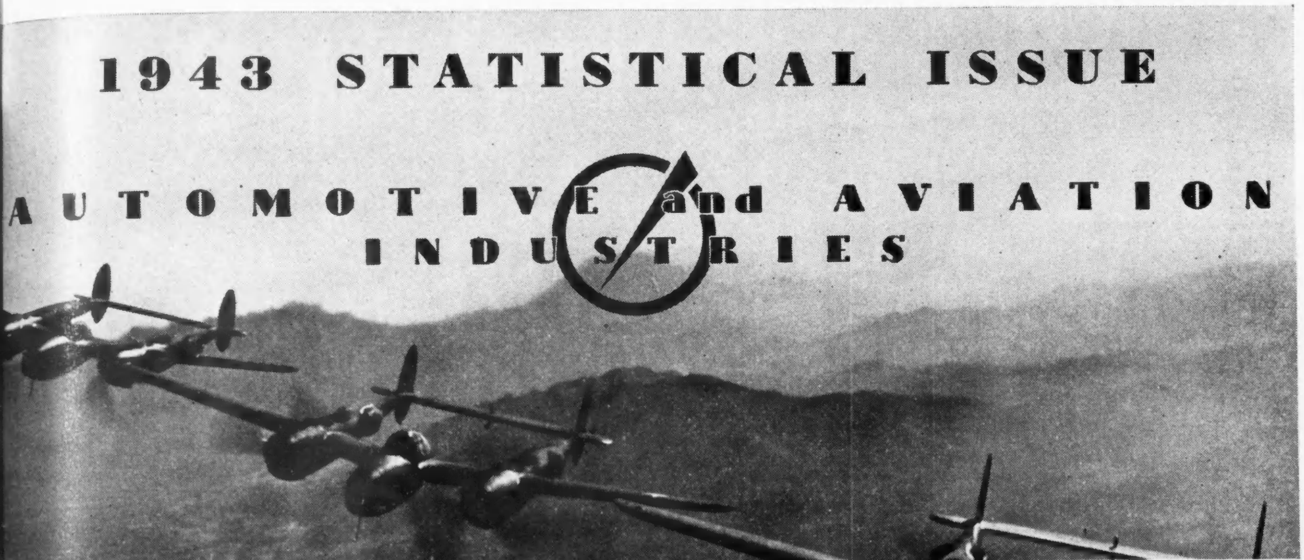
Result: Delivery to the Army in *one week* of equipment which normally would have taken many weeks to produce. An Army-Navy "E" Award to the manufacturer and a warm letter of thanks to Ryerson.

An unusual case? Somewhat—but typical of hundreds in which Ryerson stocks and Ryerson service have helped get war equipment started *faster*—on their way *sooner* to our fighting men.

In all probability, Ryerson Steel-Service can assist you on your rush war production contracts, if "spot" steel is required. One of the ten strategically-located Ryerson plants is nearby. Phone, wire or write; you'll receive quick personal cooperation!

JOSEPH T. RYERSON & SON, *Inc.*
CHICAGO · MILWAUKEE · ST. LOUIS · CINCINNATI · DETROIT
CLEVELAND · BUFFALO · BOSTON · PHILADELPHIA · JERSEY CITY

RYERSON STEEL-SERVICE



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d 15th of each month

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March 15, 1943

Truly VITAL STATISTICS

Value of War Products of Automotive Manufacturers

1941	$870,000,000
1st Half, 1942	$1,622,300,000
2nd Half, 1942	$3,025,900,000
Total 1942	$4,648,200,000

Source—A.C.W.P.

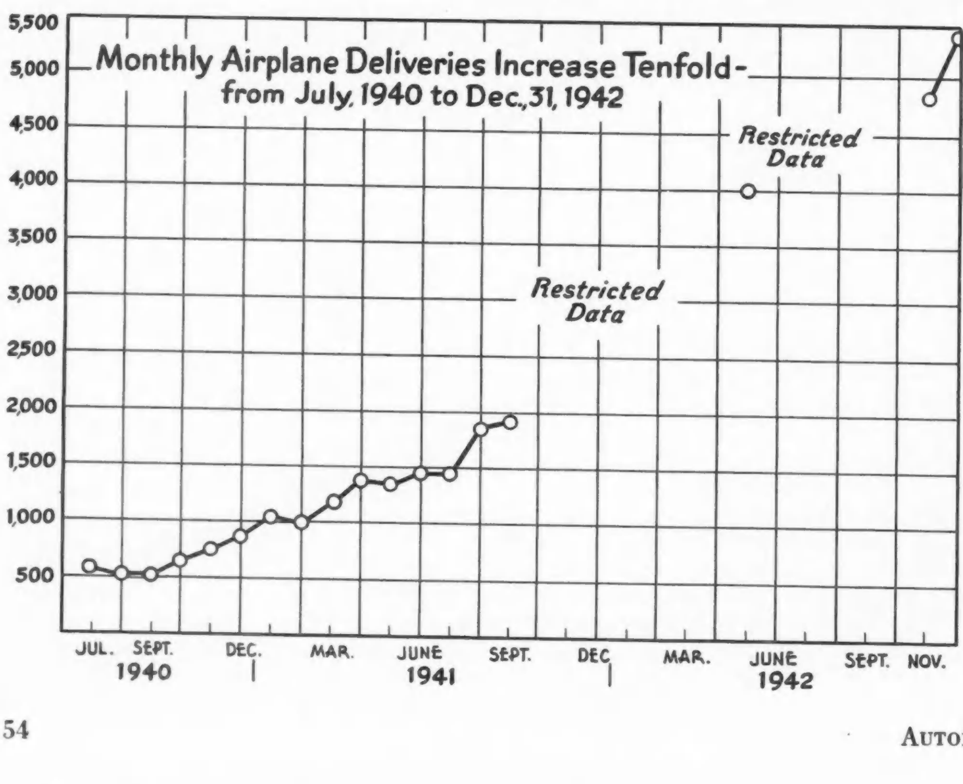
Value of War Products of Aircraft, Engine and Parts Manufacturers

1940	$544,000,000
1941	$1,750,000,000
1942*	$5,000,000,000
1943*	$12,000,000,000

**Estimate of A.C.C.*

In 1942 U. S. Produced

Airplanes	49,000
Tanks and Self-Propelled Artillery	32,000
Other Combat Vehicles	24,000
Machine Guns	678,000
Anti-Tank Guns	21,000
Anti-Aircraft Guns (20 mm & over)	17,000
Small Caliber Ammunition (rounds)	10,250,000,000
Artillery Ammunition (rounds)	181,000,000
Merchant Ships (dead weight tons)	8,200,000



Airplane Deliveries by Months—July, 1940—Dec. 1942

	Number Delivered
1940	
July	561
August	528
September	515
October	617
November	732
December	839
1941	
January	1,017
February	962
March	1,135
April	1,389
May	1,332
June	1,477
July	1,461
August	1,854
September	1,923
October	Restricted
November	Restricted
December	Restricted
12 months total (approximate)	20,000
1942	
January	Restricted
February	Restricted
March	Restricted
April	Restricted
May	4,000
June	Restricted
July	Restricted
August	Restricted
September	Restricted
October	Restricted
November	4,812
December	5,489
12 months total (approximate)	49,000

Source—War Production Board.

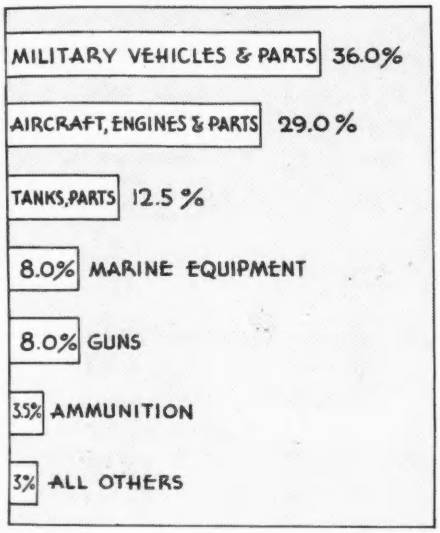
Value of Automotive Industry War Product Output

Month	Dollar Value
January	$175,400,000
February	198,800,000
March	261,800,000
April	294,300,000
May	306,200,000
June	385,800,000
July	419,700,000
August	456,800,000
September	495,000,000
October	542,400,000
November	521,400,000
December	590,600,000
Total	$4,648,200,000

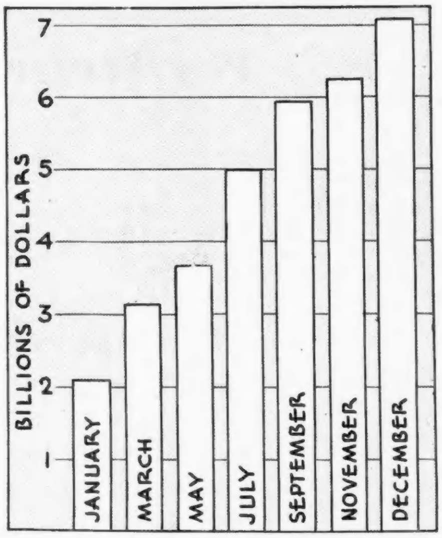
Source—A.C.W.P.
Estimated net totals, duplications eliminated.

The Automotive Industry's War Output

By Category



Annual Rate



War Production Index

November 1941 = 100

1942	Munitions Production*	War Construction†	Total War Output‡	1942	Munitions Production*	War Construction†	Total War Output‡
January	163	114	136	July	331	262	284
February	173	112	143	August	357	279	302
March	201	139	171	September	370	273	311
April	238	175	205	October	385	254	315
May	269	192	230	November	435	237	336
June	300	222	253	December	497	213	363

*—Munitions production index includes planes, ships, tanks, guns, ammunition and all campaign equipment produced during the month.
†—Includes all Government-financed war construction.
‡—Total war output includes all current war production of goods and services.

U. S. War Appropriations,

War Appropriations - Commitments - Expenditures

Cumulative from June, 1940
(Billions of Dollars)

	January 31, 1943	December 31, 1942	June 30, 1942	June 30, 1941
Appropriations	$238.0	$238.0	$175.0	$37.1
Commitments	*	†183.8	133.5	29.0
Expenditures	74.5	68.2	34.9	6.7

Source—War Production Board. *—Not available. †—Estimated.

War Appropriations - Commitments, by Agencies

Cumulative from June, 1940
(Billions of Dollars)

	December 31, 1942		June 30, 1941	
	Appropriations*	Commitments†	Appropriations	Commitments
War Department	$126.7	$96.4	$13.2	$11.1
Navy Department	64.4	47.0	12.3	11.2
Lend-Lease	18.4	12.9	7.0	2.5
RFC and Subsidiaries	15.2	15.2	2.6	2.6
Other U. S. War Agencies	13.3	12.3	2.0	1.6
Total	$238.0	$183.8	$37.1	$29.0

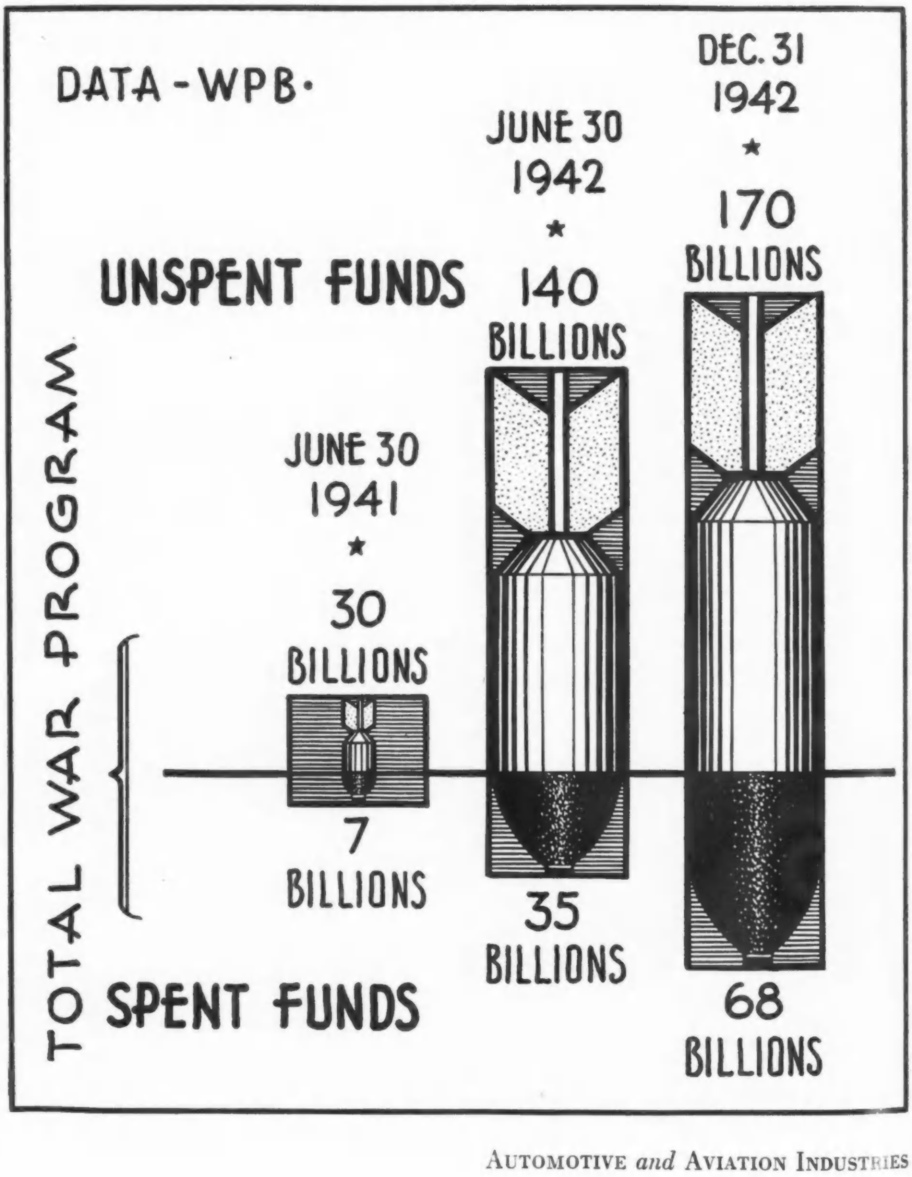
Source—War Production Board.
*—Includes funds made available by Congressional cash appropriations, contract and tonnage authorizations, and by commitments by Government corporations. †—Includes all transactions which legally reserve funds for expenditures.

War Construction Completed

(Government Financed)

1940	Millions of Dollars
Third quarter	$171
Fourth quarter	475
Total—6 months	$646
1941	
First quarter	854
Second quarter	947
Third quarter	1,341
Fourth quarter	1,677
Total—1941	$4,819
1942	
January	621
February	641
March	794
April	995
May	1,095
June	1,263
July	1,493
August	1,590
September	1,555
October	1,449
November	1,353
December	1,216
Total—1942	$14,065
Total—July,1940–Dec.1942	$19,530

What We Have Appropriated and What We Have Spent →



Commitments, Expenditures

U. S. War Expenditures

Monthly and Daily Rate

July 1940 – January 1943

(In millions of dollars)

	Monthly Expenditures*	Daily Rate
1940		
July	$199	$7.7
August	224	8.3
September	250	10.4
October	322	11.9
November	406	16.9
December	510	20.4
6-month total	$1,911	$12.5
1941		
January	609	23.4
February	634	27.6
March	809	31.1
April	833	32.0
May	951	36.6
June	908	36.3
July	1,023	39.3
August	1,290	49.6
September	1,447	57.9
October	1,854	68.7
November	1,549	67.3
December	1,988	76.5
12-month total	$13,895	$45.6
1942		
January	2,193	81.2
February	2,401	100.0
March	3,025	116.3
April	3,461	133.1
May	3,824	147.1
June	4,213	162.0
July	4,708	181.1
August	5,163	198.6
September	5,459	218.4
October	5,722	211.9
November	6,112	244.5
December	6,125	235.6
12-month total	$52,406	$169.1
1943		
January	6,254	240.5
Total to date	$74,466	

*—Include checks cleared by the Treasury and payable from war appropriations, and net outlays of Government corporations for war purposes.
Source—War Production Board.

War Appropriations—By Type

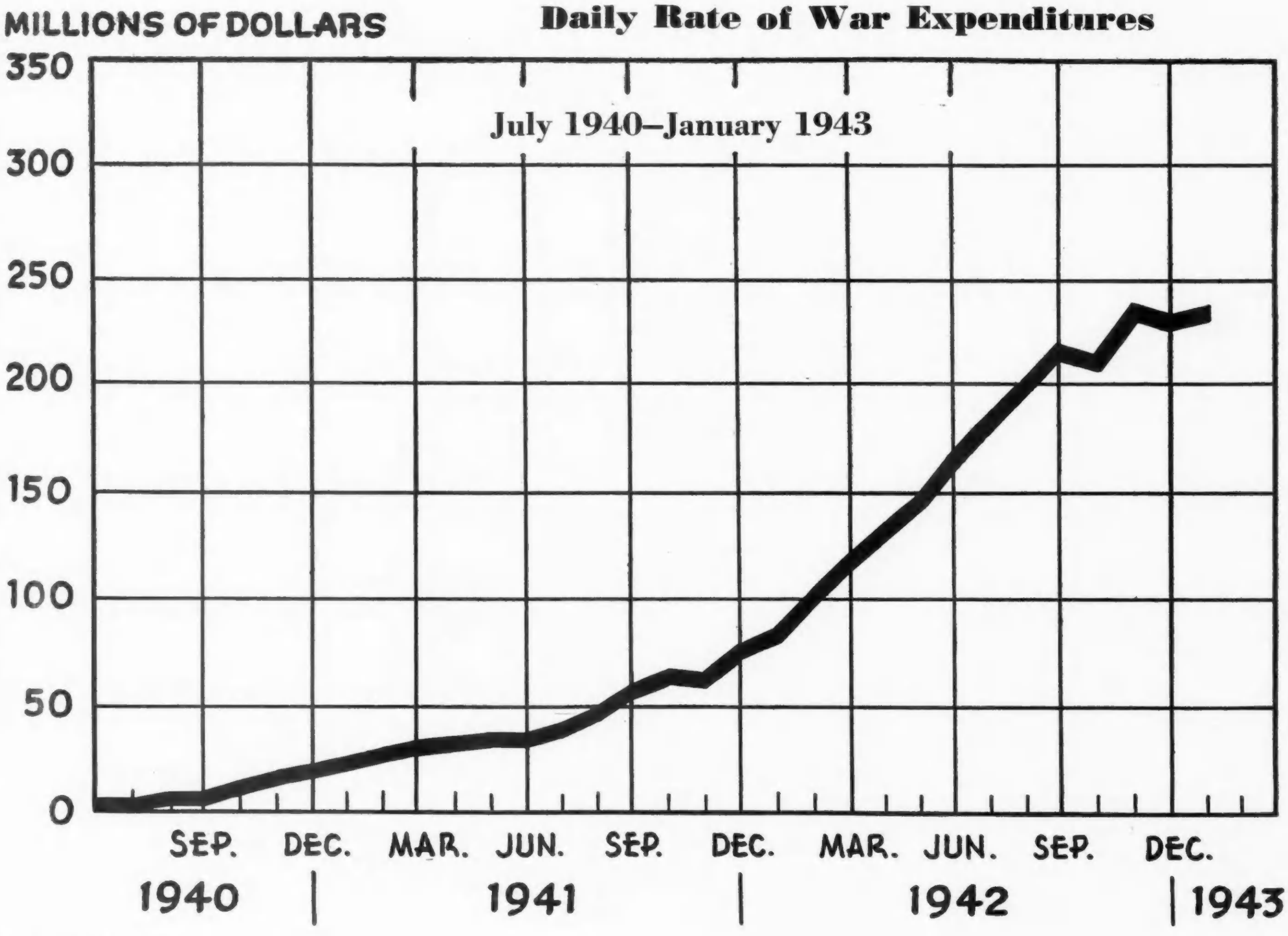
Cumulative June 1940, through December, 1942

	Billions of Dollars	Per Cent of Total
Aircraft	$56.8	24
Navy and Army vessels	36.9	16
Non-munitions items*	34.4	14
Ground ordnance and signal equipment	34.3	14
Miscellaneous munitions	23.3	10
Industrial construction	18.4	8
Non-industrial construction	17.6	7
Merchant vessels	6.5	3
Unclassified	9.8	4
Total	$238.0	100

Source—War Production Board.

*—Pay, subsistance, travel for armed forces and civilians, agricultural commodities for export and miscellaneous expense.

Daily Rate of War Expenditures



Distribution of Major War Supply Contracts and Allocations by Agency*

Arranged by States According to Volume of Contracts Awarded
Cumulative, June, 1940 through November, 1942

(Thousands of Dollars)

STATE	Total Reported	Army, Navy, Maritime Com., Treasury and Foreign Purchasing Com.	Department of Commerce	National Housing Agency	FEDERAL WORKS AGENCY			FEDERAL SECURITY AGENCY		Federal Loan Agency
					O.A., W.P.A., P.B.A., P.W.A.		W.P.A. Expenditures			
			C.A.A.	F.P.H.A.	Grants	Loans		Off. Ed.	N.Y.A.	R.F.C.
Off Continent and Unassigned	$12,283,662	$11,557,868	....	$43,917	$17,163	....	$22,336	$1,672	$150	$640,556
California	10,204,305	9,884,275	$8,944	200,376	24,986	....	36,718	17,284	3,917	27,805
Michigan	9,562,206	9,410,883	2,940	78,867	10,896	$1,170	9,115	11,502	4,961	31,872
New York	9,158,003	8,997,062	7,123	56,034	4,410	....	27,574	26,066	11,251	28,483
Ohio	7,720,924	7,501,140	218	87,663	7,830	52	14,240	11,653	5,780	92,348
New Jersey	7,180,116	7,071,902	2,097	41,343	1,615	45	12,675	6,547	3,027	40,865
Pennsylvania	6,558,997	6,352,648	2,843	131,762	2,703	358	16,045	24,479	9,681	18,478
Illinois	5,655,705	5,558,243	....	45,451	3,031	230	21,204	10,335	8,580	8,631
Connecticut	4,752,670	4,678,448	1,860	55,632	5,789	250	4,048	3,250	1,281	2,112
Massachusetts	4,299,529	4,231,503	1,948	23,541	1,595	159	25,391	7,816	3,442	4,134
Indiana	3,949,876	3,880,607	1,466	39,301	4,139	489	8,189	7,154	3,191	5,340
Texas	3,642,368	3,501,415	9,710	67,528	20,148	323	20,278	10,237	6,532	6,197
Washington	3,458,719	3,282,083	2,729	136,626	9,202	640	13,704	5,661	1,438	6,636
Maryland	2,652,588	2,548,871	....	68,446	5,856	300	8,173	3,055	1,484	16,403
Wisconsin	2,301,519	2,276,431	....	7,606	427	....	6,482	6,024	3,692	857
Virginia	1,997,457	1,822,591	144	133,745	26,011	280	6,452	3,760	2,277	2,197
Kansas	1,995,252	1,945,160	444	29,601	1,900	....	3,962	3,476	2,044	8,665
Missouri	1,827,846	1,784,533	310	15,158	4,688	10	10,227	3,973	2,953	5,994
Alabama	1,176,957	1,067,697	1,270	74,320	7,978	662	10,234	5,625	2,552	6,619
Louisiana	925,121	846,906	5,827	7,823	4,828	1,074	9,604	4,007	2,074	42,978
Florida	889,961	810,428	7,246	25,076	4,692	230	27,190	4,564	1,916	8,619
Oklahoma	875,603	851,590	1,840	5,100	2,498	....	6,428	3,827	3,719	601
Minnesota	869,134	853,141	....	....	53	....	8,961	3,660	2,472	847
Tennessee	830,747	804,168	690	8,591	3,815	187	4,717	4,941	2,010	1,628
Maine	786,544	754,857	3,293	11,303	3,563	....	9,446	1,443	1,682	957
Oregon	774,430	692,266	3,086	56,655	747	56	8,865	6,123	830	5,802
Georgia	731,151	669,294	5,047	32,621	4,917	183	7,652	4,884	3,518	3,095
North Carolina	692,129	636,418	587	30,768	7,748	221	8,633	3,905	3,171	678
Rhode Island	570,567	549,851	233	13,775	3,020	....	2,216	869	490	13
Iowa	569,434	555,464	....	5,117	537	....	2,920	2,179	2,282	935
Mississippi	555,978	523,669	1,430	14,088	3,460	228	6,418	3,961	2,342	382
Kentucky	544,282	475,228	1,720	8,986	1,784	....	8,779	4,045	2,970	40,770
West Virginia	512,886	489,043	....	11,259	964	....	3,882	4,186	3,298	254
Nebraska	471,925	461,530	....	3,834	85	....	3,555	1,230	1,203	488
Utah	462,862	430,817	1,574	21,839	1,848	....	3,396	2,780	528	80
Colorado	459,452	440,709	421	3,411	825	....	7,054	2,950	855	3,227
Arkansas	415,379	389,412	563	16,052	1,827	97	2,434	2,026	2,301	667
South Carolina	359,525	303,017	3,674	23,951	4,425	361	19,889	2,525	1,543	140
Delaware	290,154	283,080	1,297	3,539	39	....	1,344	699	156	....
Arizona	257,051	237,239	2,310	9,681	842	....	4,372	929	359	1,319
District of Columbia	186,152	65,884	....	82,426	1,857	572	8,744	1,121	381	25,167
Nevada	175,929	166,104	2,082	5,870	1,273	....	289	155	36	120
New Hampshire	155,293	140,135	1,462	7,760	991	....	3,185	1,259	413	88
Idaho	109,196	101,324	873	2,995	67	....	1,923	1,195	733	86
New Mexico	94,959	85,522	2,581	1,751	84	....	3,246	1,110	432	233
Vermont	72,689	67,906	765	1,588	115	....	1,173	601	344	197
South Dakota	62,701	57,892	301	2,107	112	....	1,067	564	658	....
Montana	61,615	54,116	2,179	1,535	....	....	2,576	605	361	243
Wyoming	33,312	29,044	1,040	813	196	....	581	932	188	518
North Dakota	5,195	1,776	892	....	....	....	1,152	622	602	151
Total Contracts Awarded	$114,179,955	$110,181,190	$97,059	$1,757,231	$217,579	$8,177	$458,738	$243,406	$122,100	$1,094,475

*—War Production Board.

Army, Navy, Maritime Commission, Treasury, Foreign Purchasing Missions—Total of prime supply contracts and facilities projects. Defense Plant Corporation and R.F.C. commitments for industrial facilities are included. Data for the Treasury Department cover defense aid contracts of the procurement division awarded since March 5, 1942. Data for the British Empire and other foreign purchasing missions cover contracts awarded since September, 1939.

Civil Aeronautics Authority—Awards for airport expansion program.

National Housing Agency—Awards for war housing.

Office of Administrator, Work Projects Administration, Public Buildings Administration and Public Works Administration—Allotments for construction projects under Title II of Lanham Act, through Sept. 1942.

Work Projects Administration—Expenditures on certified war projects July 1, 1940 through Sept. 30, 1942.

Office of Education—War training expenditures.

National Youth Administration—Allotments for fiscal year 1941, and encumbrances from July 1, 1941 through November 30, 1942.

Reconstruction Finance Corporation—War loan commitments for working capital and for non-industrial facilities.

Expansion of War Industrial Facilities

Cumulations are from June, 1940

(Millions of Dollars)

	Commitments as of Dec. 31, 1942	Completions as of Dec. 31, 1942	Value Completed During December 1942	Value Completed During November 1942
Total Government Financed	$14,043	$8,933	$605	$641
Construction	6,804	5,093	292	332
Machinery and Equipment	7,239	3,840	313	309

Non-industrial War Construction

	Commitments as of Dec. 31, 1942	Completions as of Dec. 31, 1942	Value Completed During December 1942	Value Completed During November 1942
Total Government Financed	$15,128	$10,589	$610	$712
Military	13,358	9,639	546	650
Housing and Public Works	1,770	950	64	62

War Supply Contracts

WAR PRODUCTION

Distribution of Major War Supply Contracts and Facilities Projects of the Army, Navy, Maritime Commission, Treasury and Foreign Purchasing Missions

Arranged by State According to Volume of Contract Awards.
Cumulative June, 1940 through November, 1942
(Thousands of Dollars)

STATE	Army, Navy Maritime Com., Treasury and Foreign Purchasing Com.	SUPPLY CONTRACTS				FACILITIES PROJECTS		
		Total	Aircraft	Ships	All Others	Total	Industrial	Non-Industrial
Off Continent and Unassigned	$11,557,868	$8,202,547	$1,851,719	$258,923	$6,091,905	$3,355,321	$673,820	$2,681,501
California	9,884,275	8,252,090	5,387,836	2,394,162	470,092	1,632,185	690,066	942,119
Michigan	9,410,883	8,268,176	1,467,100	307,786	6,493,290	1,142,707	1,076,663	66,044
New York	8,997,062	7,751,792	3,347,108	578,232	3,826,452	1,245,270	893,734	351,536
Ohio	7,501,140	6,224,028	1,713,540	767,317	3,743,171	1,277,112	1,162,307	114,805
New Jersey	7,071,902	6,439,950	2,175,897	2,160,997	2,103,056	631,952	425,107	206,845
Pennsylvania	6,352,648	5,034,789	493,613	937,361	3,603,815	1,317,859	1,128,648	189,211
Illinois	5,558,243	4,331,691	1,167,742	119,833	3,044,116	1,226,552	1,047,481	179,071
Connecticut	4,678,448	4,445,960	2,281,065	311,873	1,853,022	232,488	212,716	19,772
Massachusetts	4,231,503	3,772,412	273,756	1,616,507	1,882,149	459,091	294,745	164,346
Indiana	3,880,607	2,798,546	1,040,903	114,767	1,642,876	1,082,061	910,310	171,751
Texas	3,501,415	1,878,877	694,827	845,721	338,329	1,622,538	855,606	766,932
Washington	3,282,083	2,801,008	1,147,706	1,456,023	197,279	481,075	239,339	241,736
Maryland	2,548,871	2,174,958	1,223,318	363,116	588,524	373,913	202,210	171,703
Wisconsin	2,276,431	1,847,323	126,302	477,711	1,243,310	429,108	375,257	53,851
Kansas	1,945,160	1,524,038	1,402,327	9,294	112,417	421,122	272,531	148,591
Virginia	1,822,591	1,117,567	623	989,543	127,401	705,024	204,145	500,879
Missouri	1,784,533	1,149,954	155,032	157,016	837,906	634,579	505,267	129,312
Alabama	1,067,697	548,152	....	270,098	278,054	519,545	380,262	139,283
Oklahoma	851,590	453,667	385,819	....	67,848	397,923	186,205	211,718
Louisiana	846,906	271,609	68,496	137,738	65,375	575,297	337,545	237,752
Florida	810,428	345,749	950	297,900	46,889	464,679	51,473	413,206
Minnesota	853,141	580,203	3,824	22,915	553,464	272,938	267,998	4,940
Tennessee	804,168	364,100	94,723	13,891	255,486	440,068	262,428	177,640
Maine	754,857	680,366	....	605,816	74,550	74,491	28,671	45,820
Oregon	692,266	485,713	688	423,345	61,680	206,553	71,299	135,254
Georgia	669,294	384,076	409	149,638	234,029	285,218	97,451	187,767
North Carolina	636,418	372,888	19,468	97,874	255,546	263,530	40,707	222,823
Iowa	555,464	370,739	171	3,169	367,399	184,725	152,692	32,033
Rhode Island	549,851	360,687	242	40,323	320,122	189,164	56,082	133,082
Mississippi	533,669	279,990	190	219,285	60,525	243,679	59,212	184,467
West Virginia	489,043	238,307	....	86,053	152,254	250,736	249,041	1,695
Kentucky	475,228	129,798	32,556	....	97,242	345,430	197,950	147,480
Nebraska	461,530	244,203	166,359	3,367	74,477	217,327	88,185	129,142
Colorado	440,709	135,573	999	64	134,510	305,156	135,355	169,781
Utah	430,817	61,682	....	....	61,682	369,135	227,539	141,596
Arkansas	389,412	51,981	....	....	51,981	337,431	220,331	117,100
South Carolina	303,017	158,158	....	25,233	132,925	144,859	39,727	105,132
Delaware	283,080	247,810	18,850	190,416	38,544	35,270	22,116	13,154
Arizona	237,239	27,924	17,758	....	10,166	209,315	93,342	115,973
Nevada	166,104	....	....	....	....	166,104	105,524	60,580
New Hampshire	140,135	92,917	....	....	92,917	47,218	30,925	16,293
Idaho	101,324	3,214	....	....	3,214	98,110	14,332	83,778
New Mexico	85,522	1,016	....	....	1,016	84,506	2,836	81,670
Vermont	67,906	61,212	....	571	60,641	6,694	3,947	2,747
District of Columbia	65,884	4,891	....	324	4,567	60,993	19,426	41,567
South Dakota	57,892	1,645	....	....	1,645	56,247	150	56,097
Montana	54,116	3,430	....	....	3,430	50,686	16,713	33,973
Wyoming	29,044	537	....	....	537	28,507	6,790	21,717
North Dakota	1,776	385	....	....	385	1,391	....	....
Total Contracts Awarded	$110,181,190	$84,978,328	$26,761,906	$16,454,202	$41,762,220	$25,202,862	$14,636,206	$10,566,656

*—War Production Board.

The category "Aircraft" includes contracts for airframes; airplane engines, propellers, and other parts; and certain related equipment such as parachutes and aircraft pontoons. Armament, instruments and communication equipment are excluded.

The category "Ships" includes contracts for the construction of new vessels of all kinds; the purchase of used ships; ship conversion, recommissioning, and repairs; and the purchase of marine engines and propulsion equipment.

The category "Facilities" represents the latest estimate of final cost of each construction project for which a contract has been awarded or a letter of intent or project order issued.

Awards having a value of less than $50,000 and all awar ds for foodstuffs are excluded.

War Costs World 400 Billion Dollars

To date the war has cost the world over 400 billion dollars, the Department of Commerce recently estimated. According to these estimates Germany has expended over 100 billion since Hitler came into power.

The relative standing, by countries, of the war expenditures is shown in the accompanying table.

United States	$112.3
Germany	100.0
Russia	96.0
Great Britain	65.5
France	10.1
Italy	8.0
Belgium	3.4
Poland	2.7
Czechoslovakia	1.5

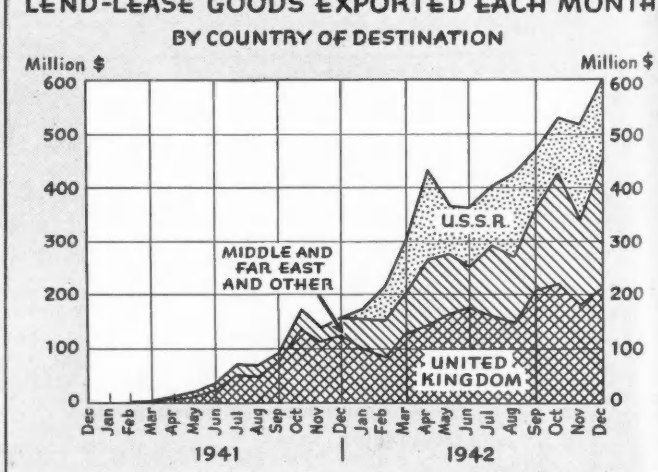
LEND-LEASE AID

Cumulative From March, 1941 Through December 31, 1942

(Thousands of Dollars)

Type of Aid	United Kingdom	Australia, New Zealand, India, Other British Terr., Egypt	U. S. S. R.	China	Other	Total	Goods and Services as Per Cent of Total	Per Cent of Total by Type of Aid
GOODS TRANSFERRED								
Military Items								
Ordnance	$147,534	$130,307	$39,639	$14,661	$41,867	$374,008		5.71
Ammunition	196,288	303,172	148,288	19,491	14,783	682,022		10.42
Aircraft and Parts	344,188	483,188	318,969	37,336	15,119	1,198,800		18.31
Tanks and Parts	60,298	255,400	210,305	922	8,790	535,715		8.18
Motor Vehicles	55,465	127,588	139,136	25,453	6,664	354,306		5.41
Watercraft and Parts	285,112	90,035	15,549	447	6,651	397,794		6.07*
Miscellaneous	82,773	30,926	39,816	7,025	6,281	166,821		2.55
Total	$1,171,658	$1,420,616	$911,702	$105,335	$100,155	$3,709,466	45.00	56.65
Industrial Materials								
Machinery	141,369	74,792	62,001	3,603	183	281,948		4.31
Metals	251,673	131,390	113,909	8,975	617	506,564		7.74
Petroleum Products	252,862	62,427	14,806	3,237	5	333,337		5.09
Miscellaneous	269,676	100,758	56,224	5,110	17,043	448,811		6.85
Total	$915,580	$369,367	$246,940	$20,925	$17,848	$1,570,660	19.00	23.99
Agricultural Products								
Foodstuffs	880,891	56,227	101,869	......	1,553	1,040,540		15.89
Miscellaneous	211,778	14,722	513	......	......	227,013		3.47
Total	$1,092,669	$70,949	$102,382	......	$1,553	$1,267,553	15.30	19.36
Total Goods Transferred	$3,179,907	$1,860,932	$1,261,024	$126,260	$119,556	$6,547,679	79.30%	100.00%
SERVICES RENDERED								
Ship Repairs, etc.	152,975	80,932	27,656	951	3,383	265,897		15.59
Shipping	429,785	227,379	106,160	13,057	59,098	835,479		49.00
Production Facilities	175,085	212,206	136,300	15,514	14,960	554,065		32.50
Miscellaneous	22,198	11,744	1,090	956	13,625	49,613		2.91
Total Services Rendered	$780,043	$532,261	$271,206	$30,478	$91,066	$1,705,054	20.70%	100.00%
TOTAL LEND-LEASE AID	$3,959,950	$2,393,193	$1,532,230	$156,738	$210,622	$8,252,733	100.00%	
Per Cent of Total—by Destination	47.98%	29.00%	18.57%	1.90%	2.55%	100.00%		

From Report to the 78th Congress submitted by Edward R. Stettinius, Jr., Lend-Lease Administrator



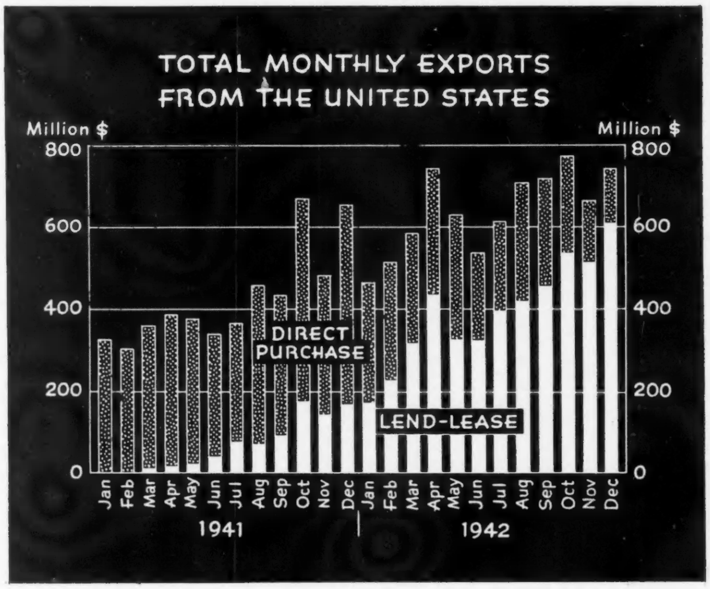
TOTAL U. S. EXPORTS

	Total U. S. Exports Including Lend-Lease (2)	Approximate Lend-Lease Exports
1941		
January	$317,953,000	
February	298,273,000	
March	350,446,000	$6,000,000
April	376,185,000	20,000,000
May	376,354,000	20,000,000
June	323,728,000	38,000,000
July	348,890,000	75,000,000
August	438,264,000	68,750,000
September	406,057,000	88,000,000
October	(1)647,462,000	162,000,000
November	481,630,000	138,000,000
December	(1)635,179,000	160,000,000
Total—1941	$5,004,421,000	$749,750,000
1942		
January	$473,521,000	$168,750,000
February	474,720,000	218,500,000
March	604,945,000	303,100,000
April	687,658,000	437,500,000
May	519,168,000	360,000,000
June	613,572,000	356,200,000
July	623,801,000	390,000,000
August	696,005,000	430,000,000
September	712,135,000	505,000,000
October	768,912,000	537,500,000
November	779,275,000	530,000,000
December	....	612,500,000
Total—1942	....	$4,849,050,000

Actual Lend-Lease Exports March 1941 to December 1942 $5,959,000,000

(1)—Figures overstated owing to inclusion in these months of an unusually large volume of shipments actually exported in earlier months.

(2)—Does not include arms and other supplies shipped to our forces abroad.

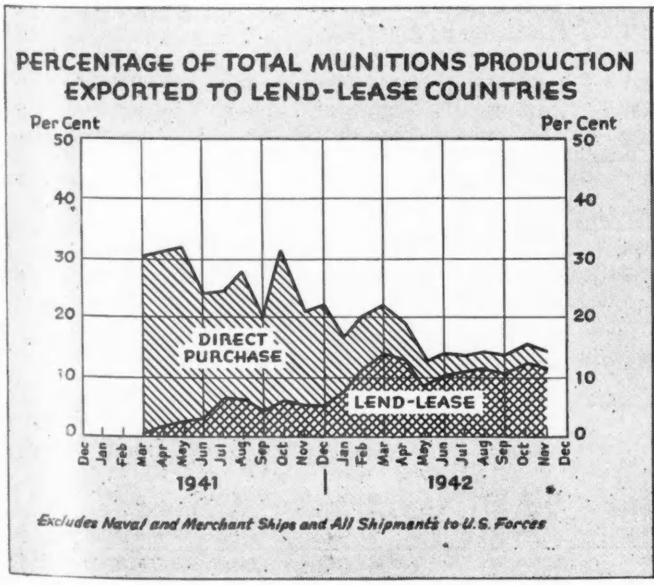


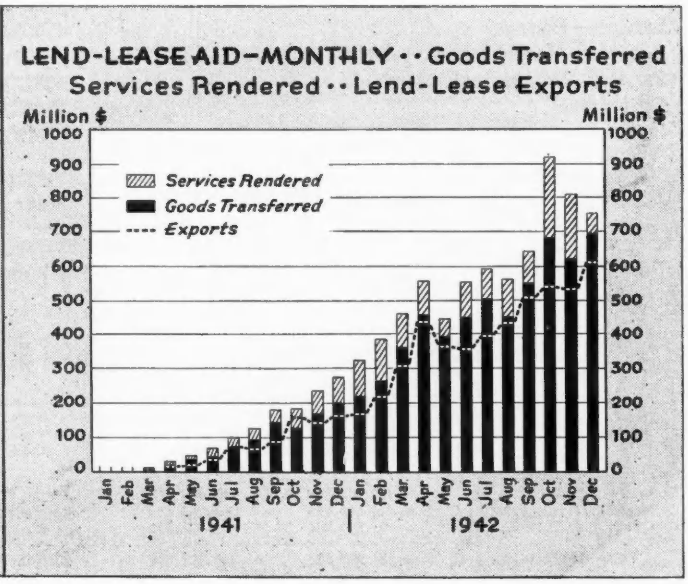
LEND-LEASE AID BY TYPE—BY MONTHS

(Millions of Dollars)

	1941						1942					
	Goods Transferred		Services Rendered		Total Aid		Goods Transferred		Services Rendered		Total Aid	
	Monthly	Cumulative	Monthly	Cumulative	Monthly	Cumulative	Monthly	Cumulative	Monthly	Cumulative	Monthly	Cumulative
January	.....	.....	.....	.....	.....	.....	220	1,130	102	436	322	1,566
February	.....	.....	.....	.....	.....	.....	260	1,390	128	564	388	1,954
March	6	6	4	4	10	10	362	1,752	106	670	468	2,422
April	20	26	8	12	28	38	455	2,207	99	769	554	2,976
May	35	61	10	22	45	83	394	2,601	55	824	449	3,425
June	41	102	22	44	63	146	459	3,060	89	913	548	3,973
July	73	175	28	72	101	247	504	3,564	91	1,004	595	4,568
August	95	270	31	103	126	373	446	4,010	114	1,118	560	5,128
September	144	414	37	140	181	554	544	4,554	99	1,217	643	5,771
October	132	546	50	190	182	736	680	5,234	235	1,452	915	6,686
November	164	710	70	260	234	970	620	5,854	190	1,642	810	7,496
December	200	910	74	334	274	1,244	694	6,548	63	1,705	757	8,253

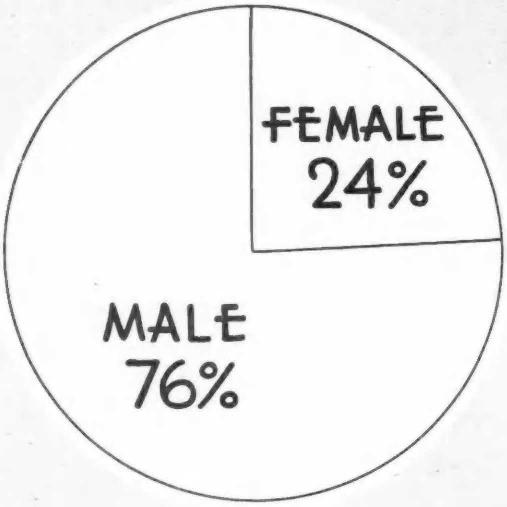
Goods Transferred include military items, industrial materials, and agricultural products.
Services Rendered consist of shipping and supply service, repair services for damaged ships, etc.





MAN POWER — **Distribution of th**

Persons 14 Years Old



Total Employed Workers—45,166,083

Distribution of All Workers—45,166,083

Distribution of the Labor Force, By Industry Group

(Persons 14 Years Old and Over)

U. S. Census of Population, 1940

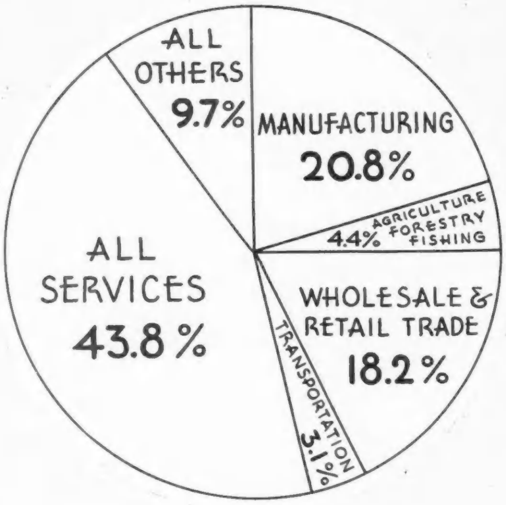
	Total	Male	Female	Percentage Distribution of Workers: Total	Male	Female
Agriculture, Forestry, and Fishery	8,475,432	7,988,343	487,089	18.8	23.5	4.4
Mining	913,000	902,061	10,939	2.0	2.7	0.1
Construction	2,056,274	2,022,032	34,242	4.6	5.9	0.3
Manufacturing	10,572,842	8,250,590	2,322,252	23.4	24.2	20.8
Transportation, Communication, and other public utilities	3,113,353	2,768,267	345,086	6.9	8.1	3.1
Wholesale and Retail Trade	7,538,768	5,509,228	2,029,540	16.7	16.2	18.2
Finance, Insurance, and Real Estate	1,467,597	1,013,297	454,300	3.2	3.0	4.1
Services—Business and Repair	864,254	787,377	76,877	1.9	2.3	0.7
Services—Personal	4,009,317	1,133,555	2,875,762	8.9	3.3	25.8
Services—Amusement and related	395,342	316,063	79,279	0.9	0.9	0.7
Services—Professional and related	3,317,581	1,472,453	1,845,128	7.3	4.3	16.6
Government	1,753,487	1,414,069	339,418	3.9	4.2	3.0
Industry not reported	688,836	450,570	238,266	1.5	1.4	2.2
Total Employed Workers	45,166,083	34,027,905	11,138,178	100.0	100.0	100.0
Public works projects and seeking work	7,623,416	5,916,335	1,707,081	.....	.....	.....
Total Labor Force	52,789,499	39,944,240	12,845,259	.....	.....	.....
Total Population	131,669,275	66,061,592	65,607,683	.....	.....	.....

Distribution of the Labor Force—By Race

	POPULATION		LABOR FORCE			Percentage Distribution		
	Total All Ages	14 Years Old and Over	Total	Male	Female	Total	Male	Female
RACE								
White	118,214,870	91,428,165	47,169,389	36,167,566	11,001,823	89.35	68.51	20.84
Negro	12,865,518	9,259,444	5,389,191	3,582,005	1,807,186	10.21	6.79	3.42
Other	588,887	415,315	230,919	194,669	36,250	.44	.37	.07
Total—1940	131,669,275	101,102,924	52,789,499	39,944,240	12,845,259	100.00	75.67	24.33

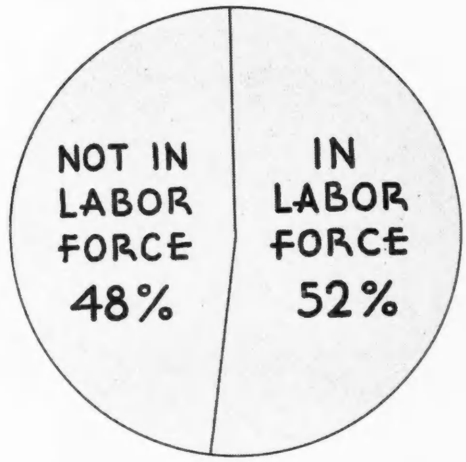
the Labor Force

Old and Over

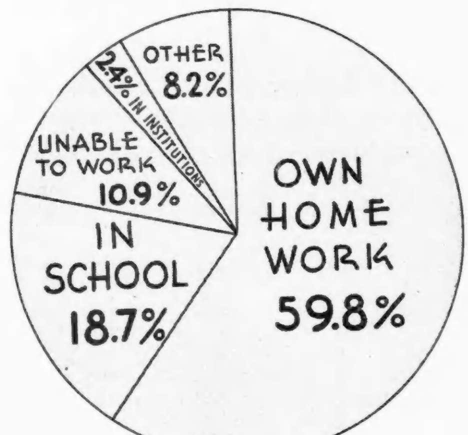


Distribution of Female Workers—11,138,178

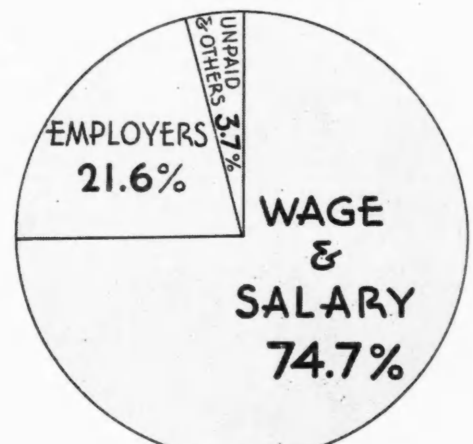
Persons 14 Years Old and Over—101,102,924



Persons Not in Labor Force —48,313,425



Employed Workers by Class —45,166,083



Employment Status and Class of Worker

(Persons 14 Years Old and Over)

	Total	Male	Female
Persons 14 years old and over	101,102,924	50,553,748	50,549,176
In Labor Force	52,789,499	39,944,240	12,845,259
Not in Labor Force	48,313,425	10,609,508	37,703,917
Engaged in own home work	28,931,869	267,125	28,664,744
In school	9,013,342	4,593,630	4,419,712
Unable to work	5,268,727	2,966,225	2,302,502
In institutions	1,176,993	767,474	409,519
Other and not reported	3,922,494	2,015,054	1,907,440
LABOR FORCE BY STATUS			
Employed workers	45,166,083	34,027,905	11,138,178
On public works projects	2,529,606	2,072,094	457,512
Seeking work	5,093,810	3,844,241	1,249,569
Total Labor Force	52,789,499	39,944,240	12,845,259
EMPLOYED WORKERS BY CLASS			
Wage and salary workers	33,726,151	24,051,306	9,674,845
Employers and own-account workers	9,757,736	8,818,829	938,907
Unpaid family workers	1,443,088	1,018,623	424,465
Class not reported	239,108	139,147	99,961
Total employed	45,166,083	34,027,905	11,138,178

U.S. Census of Population, 1940.

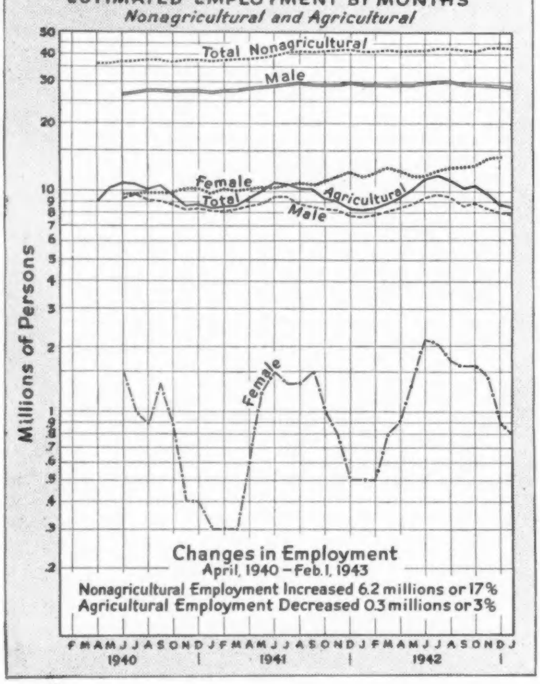
Occupation of Employed Workers

(Except Those on Public Works Projects)

	Male	Female	Total
Professional and Semiprofessional	1,875,387	1,469,661	3,345,048
Farmers and Farm Managers	4,991,715	151,899	5,143,614
Proprietors, Managers and Officials	3,325,767	423,520	3,749,287
Clerical, Sales, and Kindred Workers	4,360,648	3,156,982	7,517,630
Craftsmen, Foremen and Kindred Workers	4,949,132	106,590	5,055,722
Operatives and Kindred Workers	6,205,898	2,046,379	8,252,277
Domestic Service Workers	142,231	1,969,083	2,111,314
Protective Service Workers	677,213	4,321	681,534
Other Service Workers	1,519,482	1,257,318	2,776,800
Farm Laborers and Foremen	2,770,005	320,005	3,090,010
Other Laborers	2,965,693	98,435	3,064,128
Not Reported by kind	244,734	133,985	378,719
Total Employed	34,027,905	11,138,178	45,166,083

U.S. Census of Population, 1940.

THE CIVILIAN



Population By Age Groups, Sex,

Age Groups	TOTAL			URBAN		
	Total	Male	Female	Total	Male	Female
Under 5 years	10,541,524	5,354,808	5,186,716	5,007,137	2,545,607	2,461,530
5 to 9 years	10,684,622	5,418,823	5,265,799	5,083,240	2,567,708	2,515,532
10 to 14 years	11,745,925	5,952,329	5,793,606	5,854,770	2,937,928	2,916,842
15 to 19 years	12,333,523	6,180,153	6,153,370	6,493,936	3,155,774	3,338,162
Total, Under 20	45,305,604	22,906,113	22,399,491	22,439,083	11,207,017	11,232,066
20 to 24 years	11,587,835	5,692,392	5,895,443	6,755,377	3,168,710	3,586,667
25 to 29 years	11,096,638	5,450,662	5,645,976	6,725,909	3,203,786	3,522,123
30 to 34 years	10,242,388	5,070,312	5,172,076	6,286,218	3,034,070	3,252,148
35 to 39 years	9,545,377	4,745,659	4,799,718	5,906,293	2,879,189	3,027,104
40 to 44 years	8,787,843	4,419,135	4,368,708	5,490,678	2,714,730	2,775,948
Total, 20-44	51,260,081	25,378,160	25,881,921	31,164,475	15,000,485	16,163,990
45 to 49 years	8,255,225	4,209,269	4,045,956	5,107,261	2,561,272	2,545,989
50 to 54 years	7,256,846	3,752,750	3,504,096	4,419,140	2,241,066	2,178,074
55 to 59 years	5,843,865	3,011,364	2,832,501	3,462,821	1,732,950	1,729,871
60 to 64 years	4,728,340	2,397,816	2,330,524	2,758,293	1,333,800	1,424,493
Total 45-64	26,084,276	13,371,199	12,713,077	15,747,515	7,869,088	7,878,427
65 to 69 years	3,806,657	1,896,088	1,910,569	2,152,883	997,983	1,154,900
70 to 74 years	2,569,532	1,270,967	1,298,565	1,455,824	662,931	792,893
75 and over	2,643,125	1,239,065	1,404,060	1,463,922	626,202	837,720
Total, 65 and over	9,019,314	4,406,120	4,613,194	5,072,629	2,287,116	2,785,513
Total—All Ages	131,669,275	66,061,592	65,607,683	74,423,702	36,363,706	38,059,998
Per Cent of Total	100.00%	50.17%	49.83%	56.52%	27.62%	28.90%

Wage Earners in Automotive Plants Producing War Goods*

	Wage Earners	Man Hours
1929‡	448,000	....
1937‡	517,000	....
1942	....	....
May	542,380	106,008,000
June	570,232	114,176,000
July	605,264	125,371,000
August	642,209	156,459,000
September	659,411	130,971,000
October	676,181	141,916,000
November	697,633	....

*—From reports of Automotive Branch of W. P. B.

‡—Automobile Facts and Figures, average employment. These two years were peak production years and data embraces entire automotive industry.

Estimates of Civilian Labor Force—by Months*

Nonagriculture and Agriculture Employment.

(Millions of Persons)

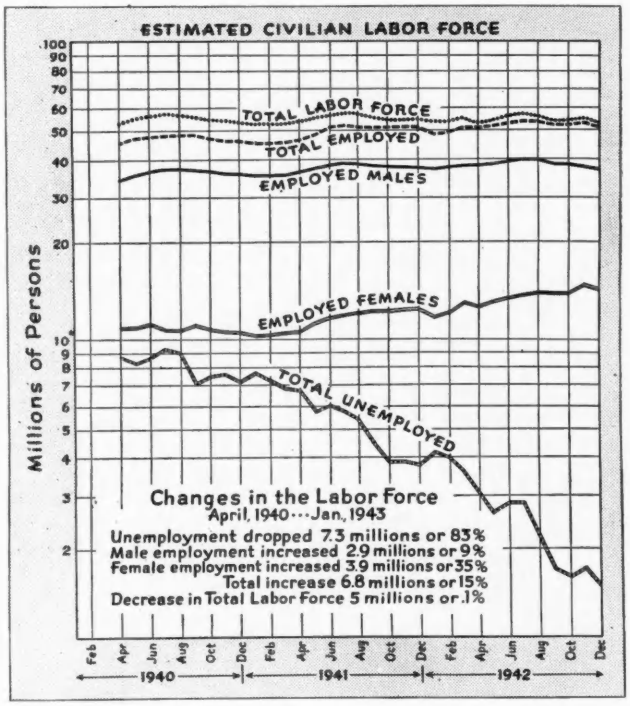
	Labor Force	EMPLOYMENT †						
			Nonagriculture			Agriculture		
		Total	Total	Male	Female	Total	Male	Female
1940								
April	53.9	45.1	36.1	†	(2)	9.0	(2)	(2)
May	54.7	46.3	36.1	(2)	(2)	10.2	(2)	(2)
June	56.2	47.6	36.6	26.9	9.7	11.0	9.5	1.5
July	56.9	47.6	36.8	27.0	9.8	10.8	9.8	1.0
August	56.6	47.7	37.6	27.7	9.9	10.1	9.2	0.9
September	54.9	47.9	37.5	27.6	9.9	10.4	9.1	1.3
October	54.4	47.0	37.3	27.4	9.9	9.7	8.8	0.9
November	53.7	46.3	37.6	27.5	10.1	8.7	8.3	0.4
December	53.4	46.3	37.6	27.4	10.2	8.7	8.3	0.4
1941								
January	53.0	45.3	36.9	27.0	9.9	8.4	8.1	0.3
February	52.9	45.7	37.3	27.3	10.0	8.4	8.1	0.3
March	52.7	45.8	37.3	27.2	10.1	8.5	8.2	0.3
April	53.5	46.8	37.6	27.6	10.0	9.2	8.6	0.6
May	54.2	48.5	38.5	28.2	10.3	10.0	8.8	1.2
June	56.2	50.2	39.3	28.9	10.4	10.9	9.4	1.5
July	56.6	50.9	40.2	29.5	10.7	10.7	9.4	1.3
August	56.4	51.0	40.8	29.9	10.9	10.2	8.9	1.3
September	54.8	50.3	40.2	29.4	10.8	10.1	8.6	1.5
October	54.1	50.2	40.9	29.6	11.3	9.3	8.3	1.0
November	54.1	50.2	41.2	29.5	11.7	9.0	8.2	0.8
December	54.0	50.2	41.9	29.8	12.1	8.3	7.8	0.5
1942								
January	53.2	48.9	40.7	29.3	11.4	8.2	7.7	0.5
February	53.4	49.4	41.0	29.3	11.7	8.4	7.9	0.5
March	54.5	50.9	42.0	29.5	12.5	8.9	8.1	0.8
April	53.7	50.7	41.4	29.4	12.0	9.3	8.4	0.9
May	54.2	51.6	41.4	29.6	11.8	10.2	8.8	1.4
June	56.1	53.3	41.8	30.0	11.8	11.5	9.4	2.1
July	56.8	54.0	42.3	30.2	12.1	11.7	9.7	2.0
August	56.2	54.0	42.8	30.2	12.6	11.2	9.5	1.7
September	54.1	52.4	42.2	29.6	12.6	10.2	8.6	1.6
October	54.0	52.4	41.9	29.2	12.7	10.5	8.9	1.6
November	54.5	52.8	43.0	29.1	13.9	9.8	8.4	1.4
December	53.4	51.9	43.3	29.0	14.0	8.9	8.0	0.9
1943								
January	52.4	51.0	42.3	28.4	13.9	8.7	7.9	0.8

*—Bureau of Census.
†—Excludes institutional population and estimated number of persons in the armed forces.
‡—Not available.

LABOR FORCE

Urban and Rural—1940

RURAL-NONFARM			RURAL-FARM		
Total	Male	Female	Total	Male	Female
2,522,831	1,281,893	1,240,938	3,011,556	1,527,308	1,484,248
2,446,807	1,242,752	1,204,055	3,154,575	1,608,363	1,546,212
2,503,567	1,267,414	1,236,153	3,387,598	1,746,987	1,640,611
2,483,112	1,241,507	1,241,605	3,356,475	1,782,872	1,573,603
9,956,317	5,033,566	4,922,751	12,910,204	6,665,530	6,244,674
2,319,310	1,145,467	1,173,843	2,513,148	1,378,215	1,134,933
2,299,920	1,147,053	1,152,867	2,070,809	1,099,823	970,986
2,132,330	1,087,974	1,044,356	1,823,840	948,268	875,572
1,896,310	979,582	916,728	1,742,774	886,888	855,886
1,647,317	863,003	784,314	1,649,848	841,402	808,446
10,295,187	5,223,079	5,072,108	9,800,419	5,154,596	4,645,823
1,502,701	792,387	710,314	1,645,263	855,610	789,653
1,313,341	693,104	620,237	1,524,365	818,580	705,785
1,084,568	564,175	520,393	1,296,476	714,239	582,237
910,613	466,718	443,895	1,059,434	597,298	462,136
4,811,223	2,516,384	2,294,839	5,525,538	2,985,727	2,539,811
786,338	396,648	389,690	867,436	501,457	365,979
561,577	284,631	276,946	552,131	323,405	228,726
618,743	303,208	315,535	560,460	309,655	250,805
1,966,658	984,487	982,171	1,980,027	1,134,517	845,510
27,029,385 20.53%	13,757,516 10.45%	13,271,869 10.08%	30,216,188 22.95%	15,940,370 12.11%	14,275,818 10.84%



Estimated Civilian Labor Force, By Status and Sex*

(April, 1940 through December, 1942)

	Estimated Number—Millions of Persons								
	Labor Force			Employed			Unemployed †		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
1940									
April	53.9	40.6	13.3	45.1	34.1	11.0	8.8	6.5	2.3
May	54.7	41.3	13.4	46.3	35.3	11.0	8.4	6.0	2.4
June	56.2	42.3	13.9	47.6	36.4	11.2	8.6	5.9	2.7
July	56.9	43.1	13.8	47.6	36.8	10.8	9.3	6.3	3.0
August	56.6	42.9	13.7	47.7	36.9	10.8	8.9	6.0	2.9
September	54.9	41.5	13.4	47.9	36.7	11.2	7.0	4.8	2.2
October	54.4	41.3	13.1	47.0	36.2	10.8	7.4	5.1	2.3
November	53.7	41.1	12.6	46.3	35.8	10.5	7.4	5.3	2.1
December	53.4	40.9	12.5	46.3	35.7	10.6	7.1	5.2	1.9
1941									
January	53.0	40.7	12.3	45.3	35.1	10.2	7.7	5.6	2.1
February	52.9	40.6	12.3	45.7	35.4	10.3	7.2	5.2	2.0
March	52.7	40.4	12.3	45.8	35.4	10.4	6.9	5.0	1.9
April	53.5	40.9	12.6	46.8	36.2	10.6	6.7	4.7	2.0
May	54.2	40.9	13.3	48.5	37.0	11.5	5.7	3.9	1.8
June	56.2	42.3	13.9	50.2	38.3	11.9	6.0	4.0	2.0
July	56.6	42.6	14.0	50.9	38.9	12.0	5.7	3.7	2.0
August	56.4	42.4	14.0	51.0	38.8	12.2	5.4	3.6	1.8
September	54.8	41.0	13.8	50.3	38.0	12.3	4.5	3.0	1.5
October	54.1	40.4	13.7	50.2	37.9	12.3	3.9	2.5	1.4
November	54.1	40.3	13.8	50.2	37.7	12.5	3.9	2.6	1.3
December	54.0	40.2	13.8	50.2	37.6	12.6	3.8	2.6	1.2
1942									
January	53.2	40.0	13.2	48.9	37.0	11.9	4.3	3.0	1.3
February	53.4	40.0	13.4	49.4	37.2	12.2	4.0	2.8	1.2
March	54.5	40.0	14.5	50.9	37.6	13.3	3.6	2.4	1.2
April	53.7	39.8	13.9	50.7	37.8	12.9	3.0	2.0	1.0
May	54.2	40.0	14.2	51.6	38.4	13.2	2.6	1.6	1.0
June	56.1	41.1	15.0	53.3	39.4	13.9	2.8	1.7	1.1
July	56.8	41.6	15.2	54.0	39.9	14.1	2.8	1.7	1.1
August	56.2	41.1	15.1	54.0	39.7	14.3	2.2	1.4	.8
September	54.1	39.2	14.9	52.4	38.2	14.2	1.7	1.0	.7
October	54.0	39.0	15.0	52.4	38.1	14.3	1.6	.9	.7
November	54.5	38.5	16.0	52.8	37.5	15.3	1.7	1.0	.7
December	53.4	37.9	15.5	51.9	37.0	14.9	1.5	.9	.6

*—Bureau of Census, Department of Commerce.
†—Includes persons on public emergency projects.

Civilian Employment in the Federal Government

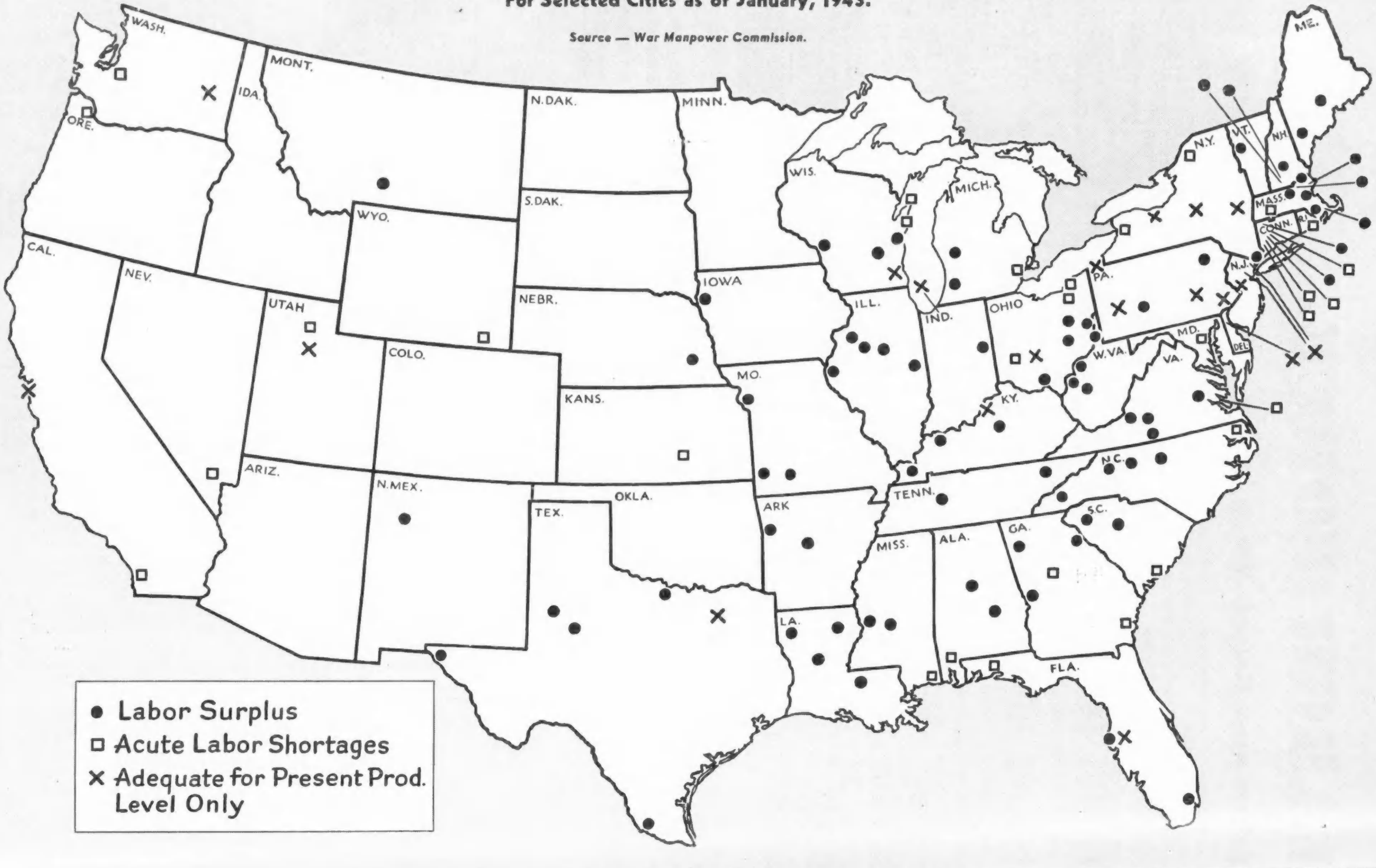
MONTH	EMPLOYEES		
	Entire Service	In Washington	Outside Washington
1941			
November	1,545,131	199,283	1,345,848
December	1,670,922	207,214	1,463,708
1942			
January	1,703,099	223,493	1,480,616
February	1,805,186	233,403	1,571,783
March	1,926,074	238,801	1,687,273
April	1,970,969	248,100	1,722,869
May	2,066,873	256,457	1,810,416
June	2,206,970	268,383	1,938,587
July	2,327,932	274,001	2,053,931
August	2,450,759	275,362	2,175,397
September	2,549,474	281,423	2,268,051
October	2,687,093	283,692	2,403,401
November	2,750,101	284,158	2,465,943

MONTH	PAYROLL		
	Entire Service	In Washington	Outside Washington
1941			
November	$237,398,486	$33,938,499	$203,459,987
December	254,453,319	35,931,301	218,522,018
1942			
January	259,404,945	38,717,067	220,687,878
February	262,106,949	39,626,787	222,487,162
March	309,764,679	41,258,486	268,506,193
April	317,207,094	42,582,221	274,624,873
May	336,568,306	43,921,811	292,646,495
June	353,364,409	45,286,667	308,077,742
July	382,373,859	48,021,151	334,352,708
August	391,502,171	48,124,986	343,377,185
September	414,594,644	48,591,176	366,003,468
October	445,135,852	50,001,609	395,134,243
November	503,248,491	48,833,436	454,415,055

THE LABOR SUPPLY

For Selected Cities as of January, 1943.

Source — War Manpower Commission.



THE LABOR SUPPLY IN SELECTED CITIES JANUARY, 1943

(Population figures as of April, 1940)

Group I — Areas in which no renewals of contracts should be made and no new contracts should be placed if alternative facilities for meeting the terms of the contract are available elsewhere.

Over 500,000

Buffalo, N. Y.
Baltimore, Md.
Washington, D. C.
Detroit, Mich.

100,000 to 500,000

Bridgeport, Conn.
Hartford, Conn.
Springfield, Mass.
Akron, Ohio
Dayton, Ohio
Wichita, Kan.
Portland, Ore.
San Diego, Cal.
Seattle, Wash.

Under 100,000

Bath, Me.
New Britain, Conn.
Waterbury, Conn.
Portsmouth, N. H.
Somerville, N. J.
Elkton, Md.
Hampton Roads, Va.
Manitowoc, Wisc.
Sterling, Ill.
Mobile, Ala.
Panama City, Fla.
Brunswick, Ga.
Macon, Ga.
Pascagonla, Miss.
Charleston, S. C.
Beaumont, Tex.
Cheyenne, Wyo.
Ogden, Utah
Las Vegas, Nev.

Group II—Areas in which only renewals of contracts at the present level of production (requiring no additional workers) should be made and in which no new contracts should be placed if alternative facilities for their production exist elsewhere.

Over 500,000

Philadelphia, Pa.
Pittsburgh, Pa.
Cleveland, Ohio
Milwaukee, Wisc.
San Francisco, Cal.

100,000 to 500,000

New Haven, Conn.
Albany, N. Y.
Massena, N. Y.
Rochester, N. Y.
Utica, N. Y.
Jersey City, N. J.
Newark, N. J.
Paterson, N. J.
Trenton, N. J.
Wilmington, Del.
Erie, Pa.
Pottstown-Reading, Pa.
Louisville, Ky.
Flint, Mich.
Canton, Ohio
Columbus, Ohio
Gary, Ind.
Tampa, Fla.
Dallas, Tex.
Salt Lake City, Utah
Spokane, Wash.

Under 100,000

Meriden, Conn.
Stamford, Conn.
Portland, Me.
Brockton, Mass.
Greenfield, Mass.
Pittsfield, Mass.
Claremont, N. H.
Newport, R. I.
Elmira, N. Y.
Long Branch, N. J.
Morristown, N. J.
Perth Amboy, N. J.
Aliquippa, Pa.
Allentown, Pa.
Berwick, Pa.
Harrisburg, Pa.
Lancaster, Pa.
Lebanon, Pa.
New Castle, Pa.
Washington, Pa.
Williamsport, Pa.
York, Pa.
Hagerstown, Md.
Elizabeth City, N. C.
Wilmington, N. C.
Point Pleasant, W. Va.
Adrian, Mich.
Battle Creek, Mich.
Benton Harbor, Mich.
Jackson, Mich.
Lansing, Mich.
Muskegon, Mich.
Pontiac, Mich.
Saginaw, Mich.
Fremont, Ohio
Hamilton, Ohio
Lima, Ohio
Lorain, Ohio
Marion, Ohio
Piqua, Ohio
Sandusky, Ohio
Warren, Ohio
Joliet, Ill.
Moline, Ill.
Springfield, Ill.
Evansville, Ind.
Michigan City, Ind.
Terra Haute, Ind.
Huntsville, Ala.
Talladega, Ala.
Savannah, Ga.
Bristol, Tenn.
Sturgeon Bay, Wisc.
Burlington, Iowa
Grand Island, Neb.
Pine Bluff, Ark.
Parsons, Kan.
Chateau, Okla.
McAlester, Okla.
Texarkana, Tex.
Pueblo, Colo.
Pocatello, Ida.
Provo, Utah
Phoenix, Ariz.
San Bernardino, Cal.
Stockton, Cal.
Everett, Wash.

Group III — Areas in which renewals of contracts at the present level of production should be made and in which new contracts may be placed providing such contracts are to be completed within six months.

Over 500,000

Chicago, Ill.
Twin Cities, Minn.
St. Louis, Mo.
Los Angeles, Cal.

100,000 to 500,000

Worcester, Mass.
Providence, R. I.
Syracuse, N. Y.
Charlotte, N. C.
Cincinnati, Ohio
Toledo, Ohio
Youngstown, Ohio
Fort Wayne, Ind.
Indianapolis, Ind.
South Bend, Ind.
Jacksonville, Fla.
Atlanta, Ga.
Memphis, Tenn.
Des Moines, Iowa
Duluth, Minn.
Omaha, Neb.
Kansas City, Mo.
Oklahoma City, Okla.
Tulsa, Okla.
New Orleans, La.
Houston, Tex.
San Antonio, Tex.
Denver, Colo.

Under 100,000

Norwalk, Conn.
Auburn, N. Y.
Batavia, N. Y.
Binghamton, N. Y.
Dunkirk, N. Y.
Jamestown, N. Y.
Kingston, N. Y.
Newburgh, N. Y.
Poughkeepsie, N. Y.
Sidney, N. Y.
Watertown, N. Y.
Atlantic City, N. J.
Johnstown, Pa.
Cumberland, Md.
East Liverpool, Ohio
Fostoria, Ohio
Mansfield, Ohio
Bloomington, Ind.
Richmond, Ind.
Aurora, Ill.
Rockford, Ill.
Eau Claire, Wisc.
Madison, Wisc.
Racine, Wisc.
Florence, Ala.
Aberdeen, Miss.
Cedar Rapids, Iowa
Sioux Falls, S. D.
Amarillo, Tex.
Corpus Christi, Tex.
Galveston, Tex.
Waco, Tex.
Fresno, Cal.
San Jose, Cal.

Group IV—Areas in which all possible effort must be made to renew contracts, place new contracts and locate new production facilities.

Over 500,000

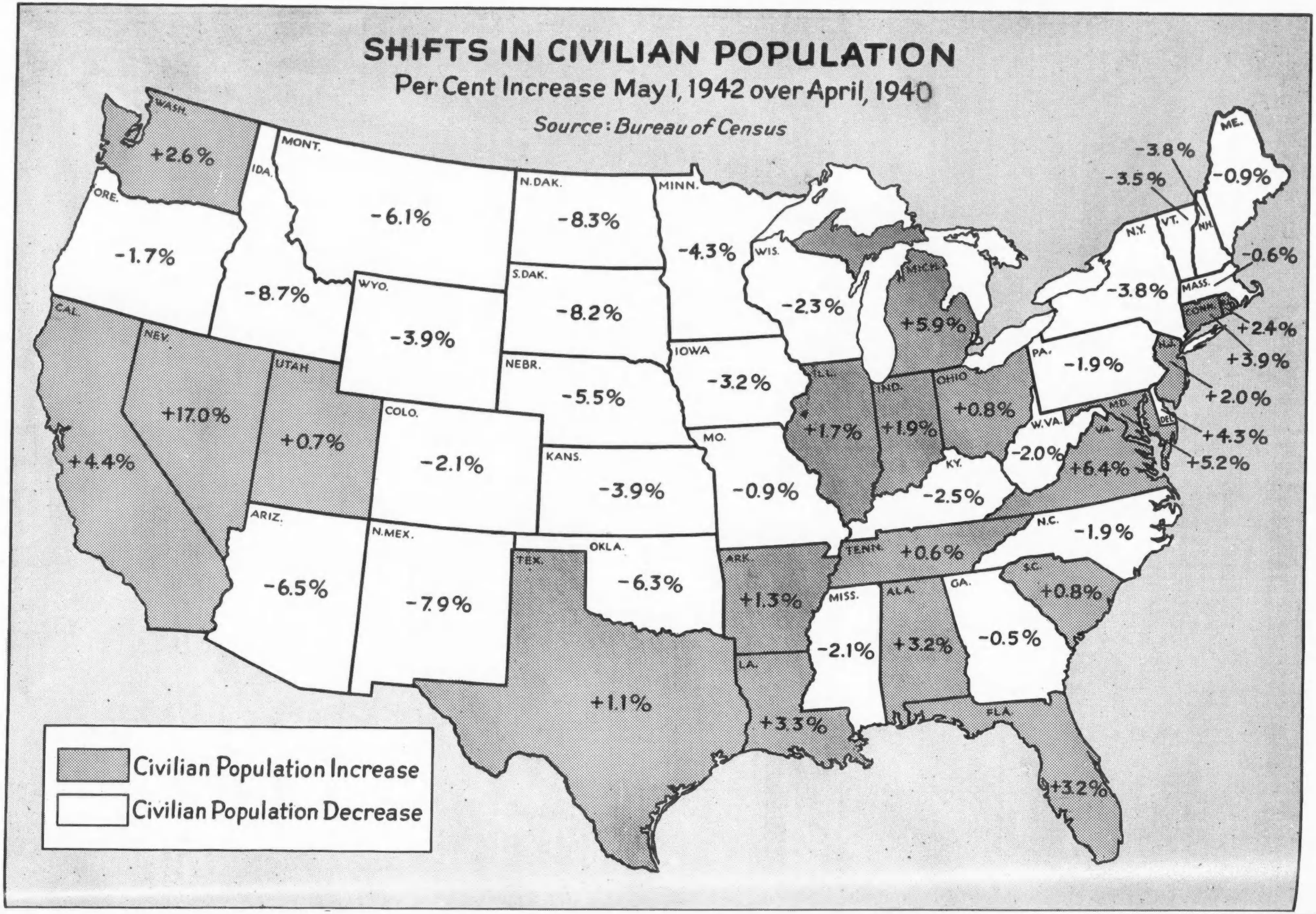
Boston, Mass.
New York, N. Y.

100,000 to 500,000

Fall River, Mass.
Lowell, Mass.
Scranton, Pa.
Richmond, Va.
Grand Rapids, Mich.
Peoria, Ill.
Birmingham, Ala.
Miami, Fla.
Knoxville, Tenn.
Nashville, Tenn.

Under 100,000

Middletown, Conn.
Torrington, Conn.
Bangor, Me.
Lewiston, Me.
Fitchburg, Mass.
Haverhill, Mass.
Salem, Mass.
Taunton, Mass.
Concord, N. H.
Manchester, N. H.
Nashua, N. H.
Burlington, Vt.
Altoona, Pa.
Asheville, N. C.
Durham, N. C.
Greensboro, N. C.
Winston Salem, N. C.
Rocky Mount, N. C.
Danville, Va.
Lynchburg, Va.
Roanoke, Va.
Charleston, W. Va.
Huntington, W. Va.
Parkersburg, W. Va.
Wheeling, W. Va.
Lexington, Ky.
Ovensboro, Ky.
Paducah, Ky.
Kalamazoo, Mich.
Coshocton, Ohio
Portsmouth, Ohio
Steubenville, Ohio
Zanesville, Ohio
Bloomington, Ill.
Danville, Ill.
Galesburg, Ill.
Herring, Ill.
Quincy, Ill.
Muncie, Ind.
La Crosse, Wisc.
Oshkosh, Wisc.
Sheboygan, Wisc.
Montgomery, Ala.
St. Petersburg, Fla.
Augusta, Ga.
Columbus, Ga.
Rome, Ga.
Jackson, Miss.
Vicksburg, Miss.
Columbia, S. C.
Greenville, S. C.
Sioux City, Iowa
Lincoln, Neb.
Fort Smith, Ark.
Little Rock, Ark.
Cape Girardeau, Mo.
Joplin, Mo.
St. Joseph, Mo.
Springfield, Mo.
Alexandria, La.
Baton Rouge, La.
Monroe, La.
Shreveport, La.
Albuquerque, N. M.
Abilene, Tex.
El Paso, Tex.
Laredo, Tex.
Lubbock, Tex.
San Angelo, Tex.
Wichita Falls, Tex.
Billings, Mont.


SHIFTS IN CIVILIAN POPULATION
Per Cent Increase May 1, 1942 over April, 1940
Source: Bureau of Census
WASH. +2.6%
ORE. -1.7%
CAL. +4.4%
IDA. -8.7%
NEV. +17.0%
MONT. -6.1%
WYO. -3.9%
UTAH +0.7%
ARIZ. -6.5%
COLO. -2.1%
N.MEX. -7.9%
N.DAK. -8.3%
S.DAK. -8.2%
NEBR. -5.5%
KANS. -3.9%
OKLA. -6.3%
TEX. +1.1%
MINN. -4.3%
IOWA -3.2%
MO. -0.9%
ARK. +1.3%
LA. +3.3%
WIS. -2.3%
ILL. +1.7%
MISS. -2.1%
MICH. +5.9%
IND. +1.9%
KY. -2.5%
TENN. +0.6%
ALA. +3.2%
OHIO +0.8%
GA. -0.5%
FLA. +3.2%
W.VA. -2.0%
VA. +6.4%
N.C. -1.9%
S.C. +0.8%
PA. -1.9%
N.Y. -3.8%
MD. +5.2%
DEL. +4.3%
N.J. +2.0%
CONN. +3.9%
+2.4%
MASS. -0.6%
VT. -3.5%
NH -3.8%
ME. -0.9%
Civilian Population Increase
Civilian Population Decrease

POPULATION SHIFTS — MAN POWER

From April, 1940, to May 1, 1942

(Source — Bureau of Census)

In planning post war markets and distribution of motor vehicles and parts, and all other manufactured goods, cognizance must be taken of these shifts in population.

Population Shifts by States

Arranged in order of percentage change

STATE	Estimated Civilian Population		Estimated Increase in Civilian Population	
	April 1, 1940	May 1, 1942	Number	Per Cent
District of Columbia	657,619	821,299	163,680	24.9
Nevada	109,989	128,697	18,708	17.0
Virginia	2,636,049	2,803,861	167,812	6.4
Michigan	5,250,591	5,562,183	311,592	5.9
Maryland	1,808,745	1,903,282	94,537	5.2
California	6,885,024	7,187,880	302,856	4.4
Delaware	265,125	276,633	11,508	4.3
Connecticut	1,706,566	1,773,101	66,535	3.9
Louisiana	2,358,256	2,435,364	77,108	3.3
Alabama	2,827,232	2,917,707	90,475	3.2
Florida	1,888,191	1,949,086	60,895	3.2
Washington	1,712,120	1,755,784	43,664	2.6
Rhode Island	706,772	723,897	17,125	2.4
New Jersey	4,160,153	4,245,062	84,909	2.0
Indiana	3,427,792	3,493,515	65,723	1.9
Illinois	7,875,107	8,008,067	132,960	1.7
Arkansas	1,947,729	1,973,033	25,304	1.3
Texas	6,399,408	6,467,012	67,604	1.1
Ohio	6,907,532	6,959,627	52,095	0.8
South Carolina	1,889,662	1,904,418	14,756	0.8
Utah	549,980	554,054	4,074	0.7
Tennessee	2,915,825	2,932,235	16,410	0.6
Georgia	3,096,424	3,081,632	−14,792	−0.5
Massachusetts	4,316,669	4,290,194	−26,475	−0.6
Maine	842,622	835,164	−7,458	−0.9
Missouri	3,783,210	3,750,257	−32,953	−0.9
Oregon	1,087,642	1,069,069	−18,573	−1.7
North Carolina	3,560,453	3,493,047	−67,406	−1.9
Pennsylvania	9,900,174	9,712,618	−187,556	−1.9
West Virginia	1,901,607	1,863,402	−38,205	−2.0
Colorado	1,117,433	1,093,569	−23,864	−2.1
Mississippi	2,183,378	2,138,559	−44,819	−2.1
Wisconsin	3,136,884	3,064,356	−72,528	−2.3
Kentucky	2,831,871	2,762,483	−69,388	−2.5
Iowa	2,536,432	2,455,132	−81,300	−3.2
Vermont	356,701	344,061	−12,640	−3.5
New Hampshire	491,308	472,731	−18,577	−3.8
New York	13,435,367	12,929,781	−505,367	−3.8
Kansas	1,794,370	1,725,176	−69,194	−3.9
Wyoming	242,332	232,864	−9,468	−3.9
Minnesota	2,787,593	2,667,916	−119,677	−4.3
Nebraska	1,312,851	1,241,143	−71,708	−5.5
Montana	557,728	523,825	−33,903	−6.1
Oklahoma	2,326,865	2,180,545	−146,320	−6.3
Arizona	496,987	464,725	−32,262	−6.5
New Mexico	531,723	489,872	−41,851	−7.9
South Dakota	642,561	589,967	−52,594	−8.2
North Dakota	641,706	588,539	−53,167	−8.3
Idaho	524,778	478,969	−45,809	−8.7
Total—May 1, 1942	131,323,136	131,315,393	−7,743	....

Population Increases in Selected Metropolitan Areas

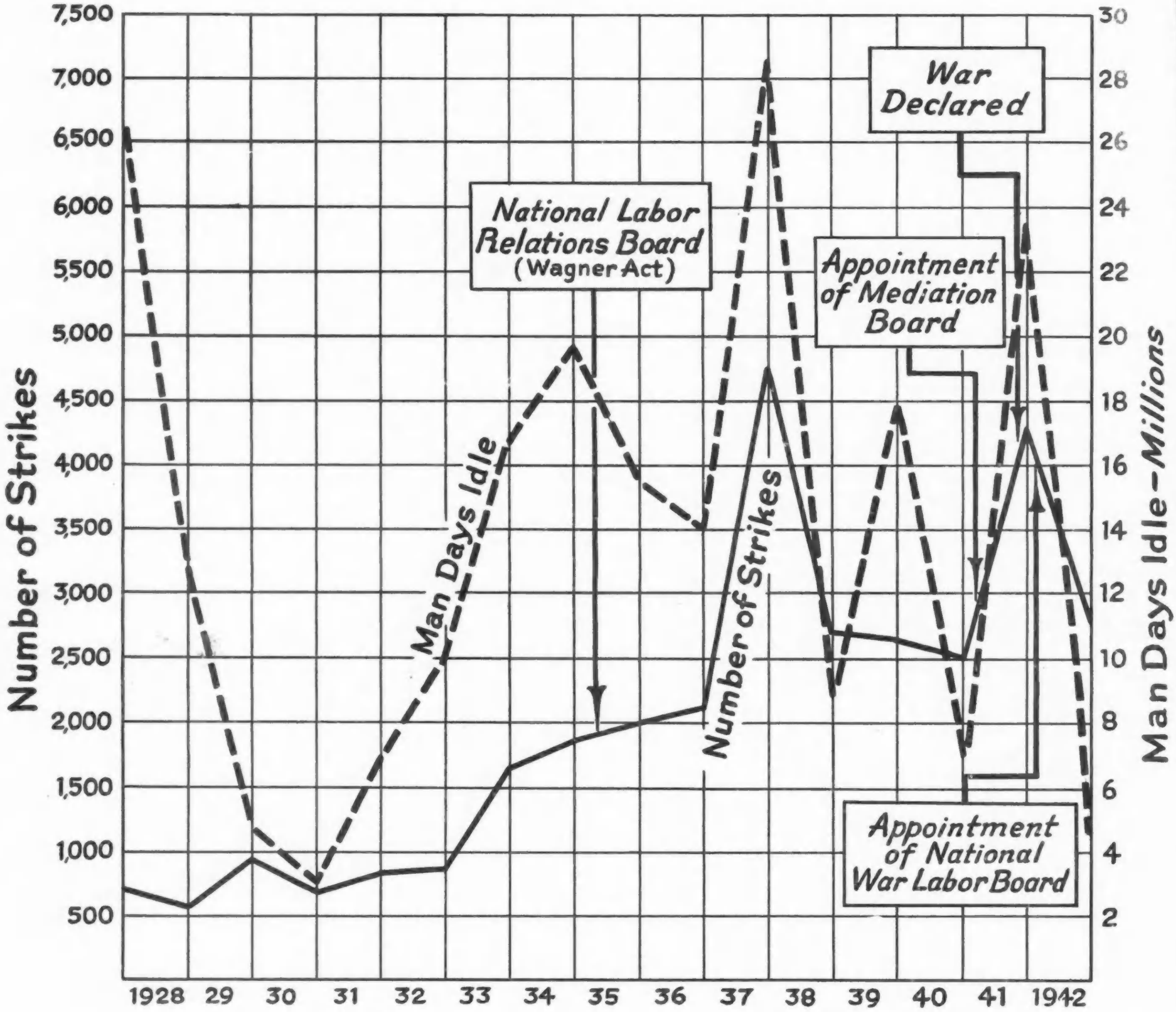
Arranged According to Percentage Increase

METROPOLITAN AREA	Estimated Civilian Population (†)		Estimated Increase in Civilian Population	
	April 1, 1940	May 1, 1942	Number	Per Cent
San Diego, Cal.	276,000	373,000	97,000	35.1
Norfolk-Portsmouth-Newport News, Va.	322,000	429,000	107,000	33.2
Mobile, Ala.	142,000	189,000	47,000	33.1
Montgomery, Ala.	111,000	144,000	33,000	29.7
Corpus Christi, Tex.	93,000	119,000	26,000	28.0
Washington, D. C.	920,000	1,151,000	231,000	25.1
Charleston, S. C.	118,000	147,000	29,000	24.6
Wichita, Kans.	143,000	178,000	35,000	24.5
Jacksonville, Fla.	210,000	258,000	48,000	22.9
Columbia, S. C.	105,000	122,000	17,000	16.2
Detroit, Mich.	2,374,000	2,710,000	336,000	14.2
Little Rock, Ark.	156,000	176,000	20,000	12.8
San Antonio, Tex.	316,000	354,000	38,000	12.0
Johnstown, Pa.	213,000	238,000	25,000	11.7
Columbus, Ga.	111,000	123,000	12,000	10.8
Louisville, Ky.	451,000	498,000	47,000	10.4
Beaumont-Port Arthur, Tex.	145,000	160,000	15,000	10.3
Dayton ,Ohio	295,000	325,000	30,000	10.2
Hartford-New Britain, Conn.	506,000	557,000	51,000	10.1
Galveston, Tex.	80,000	88,000	8,000	10.0
Macon, Ga.	84,000	92,000	8,000	9.5
Tulsa, Okla.	193,000	211,000	18,000	9.3
Birmingham, Ala.	460,000	502,000	42,000	9.1
Seattle, Wash.	503,000	549,000	46,000	9.1
Augusta, Ga.	82,000	89,000	7,000	8.5
Chattanooga, Tenn.	211,000	229,000	18,000	8.5
Savannah, Ga.	117,000	127,000	10,000	8.5
Jackson, Miss.	107,000	116,000	9,000	8.4
Dallas, Tex.	398,000	431,000	33,000	8.3
Rockford, Ill.	121,000	131,000	10,000	8.3
El Paso, Tex.	126,000	136,000	10,000	7.9
Bridgeport, Conn.	418,000	449,000	31,000	7.4
Indianapolis, Ind.	458,000	492,000	34,000	7.4
New Haven, Conn.	484,000	520,000	36,000	7.4
Canton, Ohio	235,000	252,000	17,000	7.2
Pueblo, Colo.	69,000	74,000	5,000	7.2
Waco, Tex.	102,000	109,000	7,000	6.9
St. Louis, Mo.	1,430,000	1,527,000	97,000	6.8
Davenport, Iowa	198,000	211,000	13,000	6.6
Nashville, Tenn.	257,000	274,000	17,000	6.6
San Francisco-Oakland, Cal.	1,447,000	1,542,000	95,000	6.6
Fort Wayne, Ind.	155,000	165,000	10,000	6.5
Cincinnati, Ohio	810,000	861,000	51,000	6.3
Evansville, Ind.	158,000	168,000	10,000	6.3
Hamilton-Middleton, Ohio	120,000	127,000	7,000	5.8
Tacoma, Wash.	173,000	183,000	10,000	5.8
Akron, Ohio	339,000	358,000	19,000	5.6
Austin, Tex.	111,000	117,000	6,000	5.4
Columbus, Ohio	388,000	409,000	21,000	5.4
New Orleans, La.	545,000	574,000	29,000	5.3
Atlanta, Ga.	478,000	503,000	25,000	5.2
Knoxville, Tenn.	178,000	187,000	9,000	5.1
Kalamazoo, Mich.	100,000	105,000	5,000	5.0
Baltimore, Md.	1,073,000	1,126,000	53,000	4.9
Houston, Tex.	529,000	555,000	26,000	4.9
Portland, Maine	144,000	151,000	7,000	4.9
Shreveport, La.	150,000	157,000	7,000	4.7
Wilmington, Del.	178,000	186,000	8,000	4.5
Los Angeles, Cal.	2,914,000	3,045,000	131,000	4.5
Fort Worth, Tex.	226,000	236,000	10,000	4.4
Richmond, Va.	235,000	245,000	10,000	4.3
Salt Lake City, Utah	211,000	220,000	9,000	4.3
Denver, Colo.	382,000	398,000	16,000	4.2
Springfield, Ohio	96,000	100,000	4,000	4.2
Sacramento, Cal.	170,000	177,000	7,000	4.1

†—Estimated civilian population in 1940 was derived by subtracting from total population the number of persons returned in the census as members of the armed forces. May, 1942 estimates are based on sugar ration books.

INDUSTRIAL

Number of Strikes and Man Days Idle—By Years



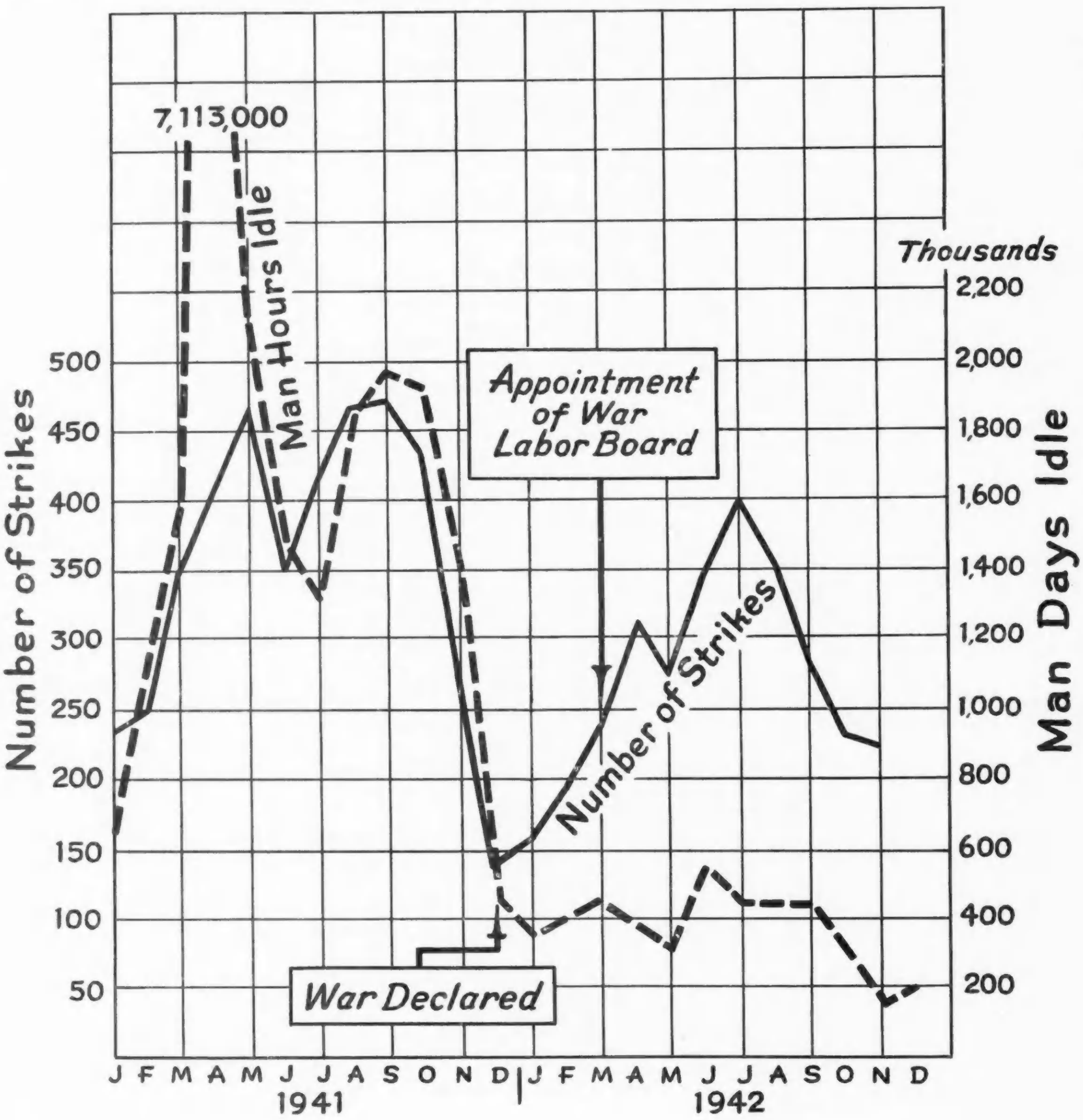
Strikes in All Industry—By Years*—1928-1942

	Strikes †	Number of Workers Involved	Workers per Strike	Man Days Idle	Average Man Days Lost Per Strike	Average Man Days Lost Per Worker Involved
1928	604	314,210	520	12,631,863	20,914	40
1929	921	288,572	313	5,351,540	5,811	19
1930	637	182,975	287	3,316,808	5,207	18
1931	810	341,817	422	6,893,244	8,510	20
1932	841	324,210	386	10,502,033	12,488	32
1933	1,695	1,168,272	689	16,872,128	9,954	14
1934	1,856	1,466,695	790	19,591,949	10,556	13
1935	2,014	1,117,213	555	15,456,337	7,674	14
1936	2,172	788,648	363	13,901,956	6,401	18
1937	4,740	1,860,621	393	28,424,857	5,997	15
1938	2,772	688,376	248	9,148,273	3,300	13
1939	2,613	1,170,962	448	17,812,219	6,817	15
1940	2,508	576,988	230	6,700,872	2,672	12
1941	4,288	2,362,620	551	23,047,556	5,375	10
1942	3,120	788,000	252	4,565,000	1,463	6

* Source—Bureau of Labor Statistics. † Beginning in month or year.

DISPUTES

Number of Strikes and Man Days Idle—By Months



Strikes in All Industry—By Months*

1940-1942

	1940		1941		1942	
	Number of Strikes †	Man Days Idle	Number of Strikes †	Man Days Idle	Number of Strikes †	Man Days Idle
January	128	246,674	240	663,185	155	390,000
February	172	289,992	257	1,134,531	190	425,000
March	178	386,981	348	1,558,457	240	450,000
April	228	441,866	403	7,112,742	310	375,000
May	239	665,688	463	2,172,303	275	325,000
June	214	484,097	357	1,504,056	350	550,000
July	244	585,651	439	1,325,758	400	450,000
August	231	706,308	465	1,825,488	350	450,000
September	253	780,570	470	1,952,652	290	450,000
October	267	915,014	432	1,925,328	235	325,000
November	207	739,807	271	1,396,585	165	175,000
December	147	458,314	143	476,471	160	200,000
Total	2,508	6,700,872	4,288	23,047,556	3,120	4,565,000

*Bureau of Labor Statistics. † Beginning in month.

Strikes in War Production*—1942

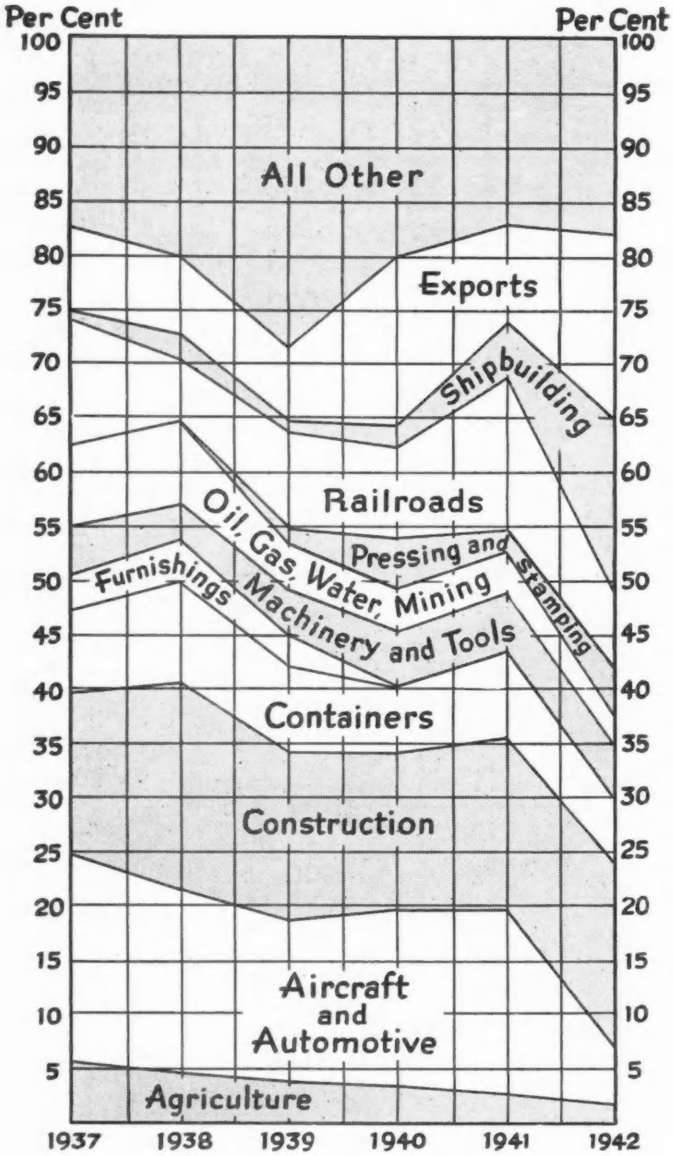
(Beginning in the Month)

Month	Number of Strikes	Workers Involved	Man-Days Lost
January	27	11,605	46,197
February	50	24,587	118,700
March	66	34,957	166,680
April	91	26,255	173,513
May	125	44,891	137,330
June	171	78,627	254,653
July	198	74,812	233,614
August	195	70,352	266,353
September	156	71,912	318,892
October	93	38,321	167,865
November	91	43,422	91,925
December	96	48,571	119,572
Total Strikes Beginning in Year	1,359	568,312	2,095,294

* National War Labor Board.

Steel Consumption

(By Industries—By Years)



Consumption of Steel by Industries*

(In Net Tons and Per Cent of Total)

	1937 Net Tons	1937 Per Cent	1938 Net Tons	1938 Per Cent	1939 Net Tons	1939 Per Cent
Agriculture	2,335,200	5.7	1,109,920	4.7	1,420,697	3.6
Aircraft and Automotive	7,814,240	18.9	4,053,280	17.2	5,906,358	15.1
Construction	6,037,920	14.7	4,398,240	18.7	6,100,386	15.6
Containers	3,218,880	7.8	2,136,960	9.1	2,978,463	7.6
Furniture, furnishings	1,494,080	3.6	868,000	3.7	1,182,235	3.0
Machinery, tools	1,804,320	4.4	831,040	3.5	1,460,000	3.7
Oil, gas, water, mining	3,034,080	7.4	1,820,000	7.7	1,841,599	4.7
Pressing, form, stamping	(a)	....	(a)	....	659,864	1.7
Railroads	4,686,080	11.4	1,443,680	6.1	3,250,022	8.3
Shipbuilding	390,880	0.9	389,760	1.7	517,771	1.3
Exports	3,032,960	7.4	1,752,800	7.4	2,594,700	6.7
All Other	7,329,716	17.8	4,765,271	20.2	11,155,458	28.7
Total	41,178,356	100.0	23,568,951	100.0	39,067,553	100.0

	1940 Net Tons	1940 Per Cent	1941 Net Tons	1941 Per Cent	1942 Net Tons	1942 Per Cent
Agriculture	1,629,849	3.3	1,682,753	2.7	1,166,482	1.8
Aircraft and Automotive	8,016,323	16.6	10,408,140	16.7	3,598,494	5.6
Construction	6,935,889	14.3	10,221,167	16.4	10,714,977	16.8
Containers	3,067,517	6.3	4,611,990	7.4	4,070,824	6.3
Furniture, furnishings	(b)	....	(b)	....	(b)	....
Machinery, tools	2,330,365	4.8	3,365,506	5.4	2,852,077	4.5
Oil, gas, water, mining	1,900,286	3.9	2,929,237	4.7	1,585,969	2.5
Pressing, form, stamping	2,296,355	4.7	3,677,127	5.9	2,782,752	4.4
Railroads	4,019,219	8.3	5,983,122	9.6	4,400,444	7.0
Shipbuilding	999,858	2.1	2,929,237	4.7	10,369,766	16.3
Exports	8,098,874	16.6	6,045,446	9.7	10,800,000	16.9
All Other	9,365,834	19.1	10,470,462	16.8	11,406,271	17.9
Total	48,660,369	100.0	62,324,187	100.0	63,748,056	100.0

*—Iron Age.
(a)—Included under Furniture and Furnishings, and All Others.
(b)—Included in Pressing, Forming and Stamping.

Steel Production by Type*

(Ingots and Steel for Castings)

In Net Tons

	Open Hearth Basic	Open Hearth Acid	Open Hearth Total	Bessemer	Crucible	Electric	Total
1934	26,047,187	307,651	26,354,838	2,421,840	595	404,651	29,181,924
1955	34,004,585	396,695	34,401,280	3,175,235	719	606,471	38,183,705
1936	48,288,605	471,858	48,760,463	3,873,472	914	865,150	53,499,999
1937	51,265,211	559,768	51,824,979	3,863,918	1,046	947,002	56,636,945
1938	28,774,999	305,017	29,080,016	2,106,340	7	565,627	31,751,990
1939	47,828,700	581,100	48,409,800	3,358,916	931	1,029,067	52,798,714
1940	60,882,840	690,243	61,573,083	3,708,573	1,024	1,700,006	66,982,686
1941	73,312,851	1,076,768	74,389,619	5,578,071	2,313	2,869,256	82,839,259
1942	....	....	76,564,593	5,553,248	.....	3,974,368	86,092,209

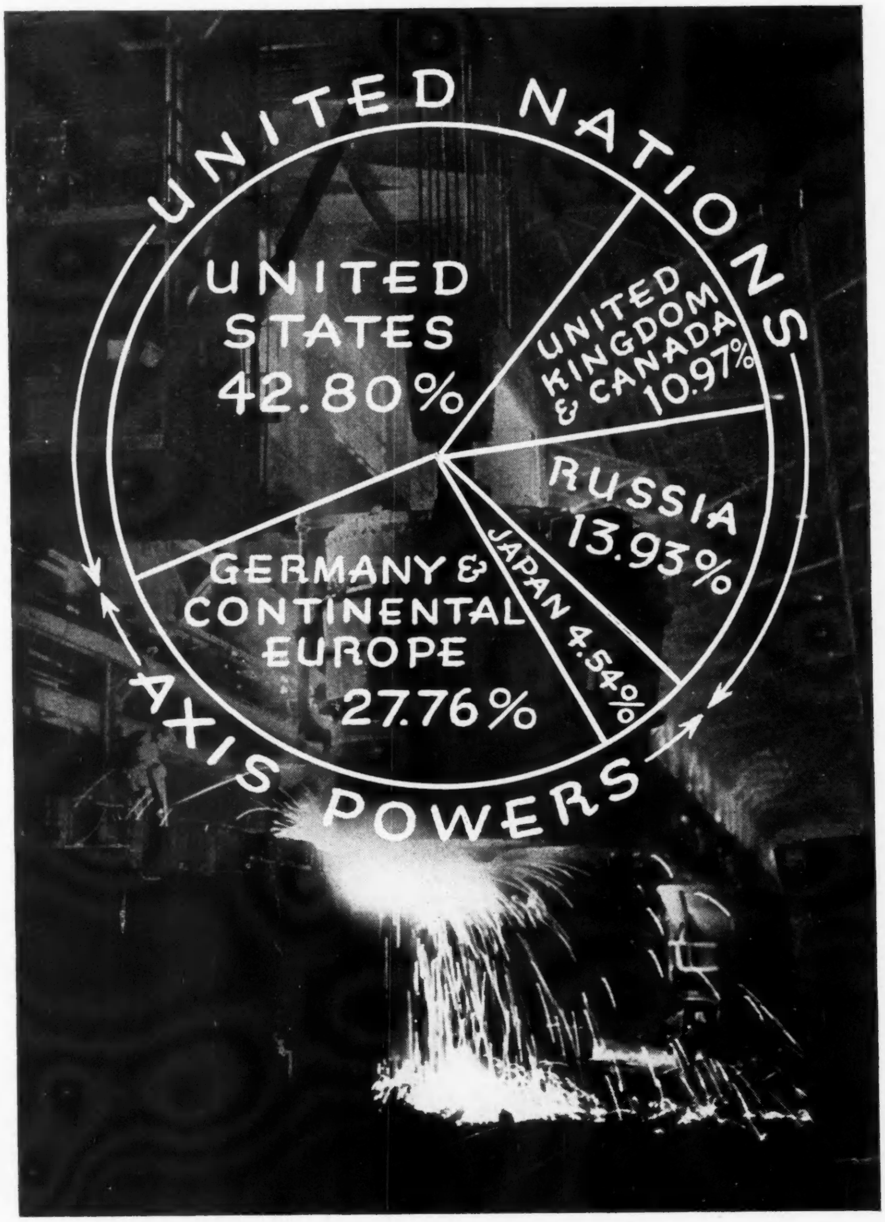
*—American Iron and Steel Institute

In Per Cent of Total Production

	Open Hearth Basic	Open Hearth Acid	Open Hearth Total	Bessemer	Crucible	Electric	Total
1934	89.26	1.05	90.31	8.30	....	1.39	100.00
1935	89.05	1.04	90.09	8.32	....	1.59	100.00
1936	90.26	.88	91.14	7.24	....	1.62	100.00
1937	90.52	.99	91.51	6.82	....	1.67	100.00
1938	90.63	.96	91.59	6.63	....	1.78	100.00
1939	90.59	1.10	91.69	6.36	....	1.95	100.00
1940	90.89	1.03	91.92	5.54	....	2.54	100.00
1941	88.50	1.30	89.80	6.74	....	3.46	100.00
1942	.....	....	89.00	6.40	....	4.60	100.00

Steel Production—1940

(United Nations vs. Axis Powers)



Steel Production —by Years*

(Ingots and Steel for Castings)

	Net Tons	Per Cent of Capacity
1917	49,787,196	....
1918	49,010,095	....
1919	38,099,180	....
1920	46,183,227	....
1921	21,638,719	....
1922	38,945,226	....
1923	49,016,991	....
1924	41,445,868	....
1925	40,704,893	....
1926	52,902,011	84.1
1927	49,272,671	75.4
1928	56,623,009	84.6
1929	61,741,962	88.7
1930	44,590,808	62.8
1931	28,607,310	38.0
1932	15,123,477	19.7
1933	25,724,643	33.5
1934	29,181,924	37.4
1935	38,183,705	48.7
1936	53,499,999	68.4
1937	56,636,945	72.5
1938	31,751,990	39.6
1939	52,798,714	64.5
1940	66,982,686	82.1
1941	82,839,259	97.3
1942	86,092,209†	96.9†
1943	93,000,000‡	....

*—American Iron and Steel Institute.
†—Preliminary.
‡—Estimated.

—by Months

	1941	1942
January	6,922,945	7,125,000
February	6,230,528	6,521,000
March	7,124,202	7,393,000
April	6,754,367	7,122,000
May	7,044,762	7,387,000
June	6,792,941	7,022,000
July	6,812,414	7,149,000
August	6,997,692	7,233,000
September	6,811,944	7,067,000
October	7,236,270	7,585,000
November	6,961,079	7,185,000
December	7,150,515	7,303,000
Total	82,839,259	86,092,000

*—American Iron and Steel Institute.

Steel Production by Countries—1940*

	Net Tons	Per Cent of Total World Production
United States	66,982,686	42.80
Canada	2,173,887	1.39
United Kingdom	15,000,000	9.58
Russia	21,800,000	13.93
Total United Nations	105,956,573	67.70
Germany (1)	28,150,000	17.99
France	6,100,000	3.90
Belgium	2,500,000	1.60
Italy	2,800,000	1.78
Luxemburg	1,450,000	.93
Hungary	900,000	.57
Spain	565,000	.36
Sweden	980,000	.63
Total—Europe	43,445,000	27.76
Japan	7,100,000	4.54
Total—Axis Powers	50,545,000	32.30
Total—All nations	156,501,573	100.00

* —American Iron and Steel Institute.
(1) Includes Saar and occupied countries Austria, Czechoslovakia and Poland.

MATERIALS—**IRON AND STEEL SCRAP**

Consumption By Years
(Net Tons)

	Scrap Home	Scrap Purchased	Scrap Total	Pig Iron	Total Scrap and Pig Iron
1936	21,169,556	19,551,553	40,721,109	33,710,470	74,431,579
1937	22,255,557	20,311,468	42,567,025	38,143,310	80,710,335
1938	12,679,902	11,226,424	23,906,326	20,724,871	44,631,197
1939	19,621,896	16,704,640	36,326,536	35,232,699	71,559,235
1940	25,047,723	19,481,948	44,529,671	46,185,828	90,715,499
1941	33,904,680	25,311,576	59,216,256	56,185,472	115,401,728
*1942	27,960,000	21,600,000	49,560,000	48,440,000	98,000,000

*—Eleven Months. Source—Minerals Year Book.

Consumption By Months
(Gross Tons)

1942	Scrap Home	Scrap Purchased	Scrap Total	Pig Iron	Total Scrap and Pig Iron
January	2,520,000	1,905,000	4,425,000	4,462,000	8,887,000
February	2,360,000	1,844,000	4,204,000	4,066,000	8,270,000
March	2,639,000	2,022,000	4,661,000	4,554,000	9,215,000
April	2,606,000	1,997,000	4,603,000	4,414,000	9,017,000
May	2,618,000	2,047,000	4,665,000	4,491,000	9,156,000
June	2,467,000	1,997,000	4,464,000	4,347,000	8,811,000
July	2,493,000	1,977,000	4,470,000	4,428,000	8,898,000
August	2,511,000	1,967,000	4,478,000	4,406,000	8,884,000
September	2,541,000	1,883,000	4,424,000	4,318,000	8,742,000
October	2,709,000	2,061,000	4,770,000	4,594,000	9,364,000
November	2,496,000	1,905,000	4,401,000	4,360,000	8,761,000

Stocks—End of Year
(Net Tons)

	At Consumers Plants Home	Purchased	Pig Iron	Total	In Suppliers' Yards	Total Scrap and Pig Iron
1939	1,936,735	3,373,363	3,773,432	9,083,530	2,867,971	11,951,501
1940	1,783,920	3,687,634	3,242,324	8,713,878	2,191,311	10,905,189
1941	1,166,551	2,559,479	1,585,199	5,311,229	1,191,369	6,502,598
1942*	....	....	1,191,000	....	†6,742,000	7,390,000

*—End of November data. Source—Minerals Year Book.
†—Includes "At Consumers Plants".

Exports to Axis Powers
(Net Tons)

1936	2,168,468	1,511,492	70%
1937	4,593,735	2,666,781	58%
1938	3,358,422	2,293,111	68%
1939	4,014,572	2,774,893	69%
1940	3,159,284	1,436,768	46%
*1941	696,110	....	....

*—January through September.

Exports By Countries
(Net Tons)

	1936	1937	1938	1939	1940	1941
Canada	71,357	207,840	103,283	196,556	411,571	......
Germany	7,615	98,731	258,611	18,574	......	......
Italy	319,341	427,161	486,883	477,004	357,627	......
Japan	1,184,536	2,140,889	1,547,617	2,279,315	1,079,141	......
Netherlands	5,350	130,609	231,341	60,665	165	......
Poland and Danzig	34,837	308,680	169,625	173,161	......	......
United Kingdom	408,659	948,838	433,829	569,288	1,100,774	......
Other Countries	136,773	300,987	127,233	240,009	210,006	......
Total	2,168,468	4,593,735	3,358,422	4,014,572	3,159,284	*696,110

*—January through September. Source—Department of Commerce.

Percent Scrap Used in Furnace Charges
(Net Tons)

	Scrap	Pig Iron	Total Charge
1938	52.0	48.0	100.0
1939	50.8	49.2	100.0
1940	49.1	50.9	100.0
1941	51.3	48.7	100.0
*1942	50.6	49.4	100.0

*—Based on eleven months data.

NE STEELS

Composition of National Emergency Steels†

CARBON-MANGANESE STEELS

	C	Mn	Si			
NE-1330	0.28–0.33	1.60–1.90	0.20–0.35	....	....	....
NE-1335	0.33–0.38	1.60–1.90	0.20–0.35	....	....	....
NE-1340	0.38–0.43	1.60–1.90	0.20–0.35	....	....	....
NE-1345	0.43–0.48	1.60–1.90	0.20–0.35	....	....	....
NE-1350	0.48–0.53	1.60–1.90	0.20–0.35	....	....	....

MANGANESE-MOLYBDENUM STEELS

	C	Mn	Si	....	....	Mo
NE-8020	0.18–0.23	1.00–1.30	0.20–0.35	....	....	0.10–0.20
NE-8442*	0.40–0.45	1.30–1.60	0.20–0.35	....	....	0.30–0.40

NICKEL-CHROMIUM-MOLYBDENUM STEELS

	C	Mn	Si	Cr	Ni	Mo
NE-8613	0.12–0.17	0.70–0.90	0.20–0.35	0.40–0.60	0.40–0.70	0.15–0.25
NE-8615	0.13–0.18	0.70–0.90	0.20–0.35	0.40–0.60	0.40–0.70	0.15–0.25
NE-8617	0.15–0.20	0.70–0.90	0.20–0.35	0.40–0.60	0.40–0.70	0.15–0.25
NE-8620	0.18–0.23	0.70–0.90	0.20–0.35	0.40–0.60	0.40–0.70	0.15–0.25
NE-8630	0.28–0.33	0.70–0.90	0.20–0.35	0.40–0.60	0.40–0.70	0.15–0.25
NE-8635	0.33–0.38	0.75–1.00	0.20–0.35	0.40–0.60	0.40–0.70	0.15–0.25
NE-8637	0.35–0.40	0.75–1.00	0.20–0.35	0.40–0.60	0.40–0.70	0.15–0.25
NE-8640	0.38–0.43	0.75–1.00	0.20–0.35	0.40–0.60	0.40–0.70	0.15–0.25
NE-8642	0.40–0.45	0.75–1.00	0.20–0.35	0.40–0.60	0.40–0.70	0.15–0.25
NE-8645	0.43–0.48	0.75–1.00	0.20–0.35	0.40–0.60	0.40–0.70	0.15–0.25
NE-8650	0.48–0.53	0.75–1.00	0.20–0.35	0.40–0.60	0.40–0.70	0.15–0.25
NE-8720	0.18–0.25	0.70–0.90	0.20–0.35	0.40–0.60	0.40–0.70	0.20–0.30

SILICON-MANGANESE AND SILICON-MANGANESE-CHROMIUM STEELS

	C	Mn	Si	Cr		
NE-9255	0.50–0.60	0.70–0.95	1.80–2.20	....	....	....
NE-9260	0.55–0.65	0.75–1.00	1.80–2.20	....	....	....
NE-9262	0.55–0.65	0.75–1.00	1.80–2.20	0.20–0.40	....	....

MANGANESE-SILICON-CHROMIUM-NICKEL-MOLYBDENUM STEELS

	C	Mn	Si	Cr	Ni	Mo
NE-9415	0.13–0.18	0.80–1.10	0.40–0.60	0.20–0.40	0.20–0.50	0.08–0.15
NE-9420	0.18–0.23	0.80–1.10	0.40–0.60	0.20–0.40	0.20–0.50	0.08–0.15
NE-9422	0.20–0.25	0.80–1.10	0.40–0.60	0.20–0.40	0.20–0.50	0.08–0.15
NE-9430	0.28–0.33	0.90–1.20	0.40–0.60	0.20–0.40	0.20–0.50	0.08–0.15
NE-9435	0.33–0.38	0.90–1.20	0.40–0.60	0.20–0.40	0.20–0.50	0.08–0.15
NE-9437	0.35–0.40	0.90–1.20	0.40–0.60	0.20–0.40	0.20–0.50	0.08–0.15
NE-9440	0.38–0.43	0.90–1.20	0.40–0.60	0.20–0.40	0.20–0.50	0.08–0.15
NE-9442	0.40–0.45	1.00–1.30	0.40–0.60	0.20–0.40	0.20–0.50	0.08–0.15
NE-9445	0.43–0.48	1.00–1.30	0.40–0.60	0.20–0.40	0.20–0.50	0.08–0.15
NE-9450	0.48–0.53	1.20–1.50	0.40–0.60	0.20–0.40	0.20–0.50	0.08–0.15
NE-9537*	0.35–0.40	1.20–1.50	0.40–0.60	0.40–0.60	0.40–0.70	0.15–0.25
NE-9540*	0.38–0.43	1.20–1.50	0.40–0.60	0.40–0.60	0.40–0.70	0.15–0.25
NE-9542*	0.40–0.45	1.20–1.50	0.40–0.60	0.40–0.60	0.40–0.70	0.15–0.25
NE-9550*	0.48–0.53	1.20–1.50	0.40–0.60	0.40–0.60	0.40–0.70	0.15–0.25

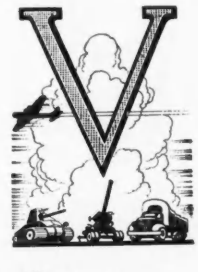
MANGANESE-SILICON-CHROMIUM STEELS

	C	Mn	Si	Cr		
NE-9630	0.28–0.33	1.20–1.50	0.40–0.60	0.40–0.60	....	....
NE-9635	0.33–0.38	1.20–1.50	0.40–0.60	0.40–0.60	....	....
NE-9637	0.35–0.40	1.20–1.50	0.40–0.60	0.40–0.60	....	....
NE-9640	0.38–0.43	1.20–1.50	0.40–0.60	0.40–0.60	....	....
NE-9642	0.40–0.45	1.30–1.60	0.40–0.60	0.40–0.60	....	....
NE-9645	0.43–0.48	1.30–1.60	0.40–0.60	0.40–0.60	....	....
NE-9650	0.48–0.53	1.30–1.60	0.40–0.50	0.40–0.60	....	....

CARBON-CHROMIUM STEELS

	C	Mn	Si	Cr	Ni	Mo
NE-52100A	0.95–1.10	0.25–0.45	0.20–0.35	1.30–0.35	0.35 max.	0.08 max.
NE-52100B	0.95–1.10	0.25–0.45	0.20–0.35	0.90–1.15	0.35 max.	0 08 max.
NE-52100C	0.95–1.10	0.25–0.45	0.20–0.35	0.40–0.60	0.35 max.	0.08 max.

* Recommended for large sections only.
† American Iron and Steel Institute.



Relationship Between Standard and NE Steels*

A 2317 A 2320	NE 8020	NE 8022	NE 9420	....
A 3115 A 3120	NE 8020	....	NE 9420	....
A 4023 A 4024	NE 8020	NE 8022	NE 9420	....
A 4119 A 4615 A 4620 A 5120 A 6120 NE 8620	NE 8715	....	NE 9420	....
A 4027 A 4032 A 4120	NE 8022	....	NE 9422	....
NE 8124	NE 8020	NE 8022	NE 9420	NE 9422
A 4320	NE 8720	....	NE 9422	....
A 4815	NE 8715	....	NE 9420	....
A 4820	NE 8720	....	NE 9422	....
A 2512	NE 8715	....	NE 9415	....
A 2515	NE 8720	....	NE 9422	....
NE 8720	....	....	NE 9420	....
NE 8817	NE 8720	....	NE 9422	....
A 2330 A 3130 A 4037 A 4042	NE 1330	....	NE 9430	NE 9630
A 4047	NE 1335	....	NE 9435	NE 9635
A 4130 A 5130 A 6130 NE 8233	NE 1330	....	NE 9430	NE 9630
NE 8339	NE 1335	....	NE 9430	NE 9630
NE 8630	NE 1330	....	NE 9430	NE 9630
A 2335	NE 1340	....	NE 9435	NE 9635
A 3135	NE 1335	....	NE 9435	NE 9635
A 5135	NE 1335	....	NE 9435	NE 9635
A 5140	NE 1340	....	NE 9435	NE 9635
A 6135	NE 1335	....	NE 9435	NE 9635
A 6140 NE 8635 NE 8735	NE 1340	....	NE 9435	NE 9635
A 4137 A 4640 NE 8739	NE 1340	....	NE 9637	NE 9437
A 3045 A 3140 A 4140 A 4645 A 5145 A 6145	NE 1345	....	NE 9640	NE 9440
A 2340 A 3141 A 3240 A 4142 NE 8442 NE 8744	NE 1345	....	NE 9842	NE 9442
A *4337	....	....	....	NE 9537
A *4340 NE *8547	....	....	....	NE 9540
A 2345 A 3145 A 4145 A 5150 A 6150 NE 8744	NE 1350	....	NE 9645	NE 9445
NE 8749 A 2350 A 3150 A 3250 A 4150 NE *8949	....	....	NE 9650	NE 9450
A 4063	....	....	NE 9255	....
A 4065	....	....	NE 9260	....
A 4068	....	....	NE 9262	....
E 52095	....	....	NE 52100C	....
E 52098	....	....	NE 52100B	....
E 52099 E 52100 E 52101 E 52107	....	....	NE 52100A	....

* American Iron and Steel Institute.

Production**

(Short Tons)

	U. S. Smelter Production from Domestic Ore	% of World Smelter Production	Imports*	Secondary as metal and in Alloys	Total Production‡
1930	697,195		408,577	467,200	1,545,500
1931	521,356	51 1925 to 1929	292,946	347,000	1,097,500
1932	272,005		195,995	248,200	588,500
1933	225,000		143,715	338,100	709,000
1934	244,227	17	213,330	377,400	823,000
1935	381,298	23	257,180	448,900	1,037,700
1936	611,410	33	190,339	484,600	1,307,100
1937	834,661	32	279,874	532,100	1,481,569
1938	562,328	25	252,164	359,800	1,064,694
1939	712,675	30	336,297	499,700	1,301,283
1940	909,084	..	491,343	532,046	1,653,089
1941	966,072	..	524,974†	726,396	1,814,992
1942	1,100,000	..	....	....	....

*—For consumption plus material entering under bond.
†—Nine months total. **—Minerals Year Book.
‡—New and old, domestic and foreign.

Consumption‡

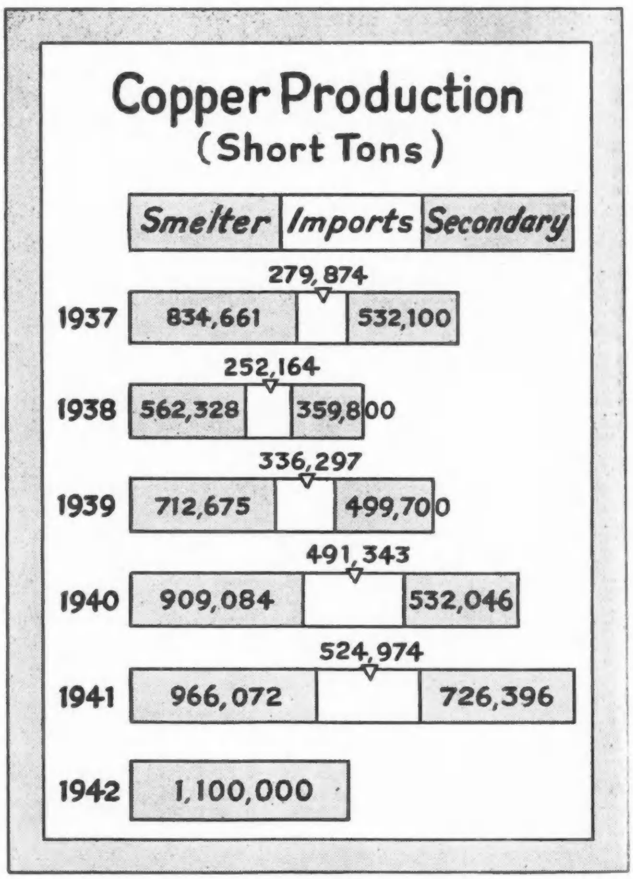
	Withdrawals on Domestic Account* New Refined	New and Old
1930	632,500	1,099,500
1931	451,050	798,000
1932	259,600	508,000
1933	339,350	677,500
1934	322,650	700,000
1935	441,350	890,500
1936	656,200	1,141,000
1937	694,906	1,227,000
1938	406,994	767,000
1939	714,873	1,215,000
1940	1,008,785	1,541,000
1941	†	†

*—No account is taken of consumers stocks.
†—Unable to publish due to confidential nature of foreign trade data.
‡—Minerals Year Book.

Exports

	Short Tons	Ratio U. S. Exports to U. S. Production	U. S. Exports to Axis Countries	% of U. S. Exports to Axis Countries
1930	376,647	54%	....	....
1931	278,937	53%	....	....
1932	164,111	60%	....	....
1933	174,627	77%	....	....
1934	312,743	128%	....	....
1935	302,873	79%	....	....
1936	262,417	43%	107,000	35%
1937	350,317	42%	149,500	57%
1938	422,014	75%	221,000	63%
1939	427,579	60%	186,500	44%
1940	427,944	47%	154,500	36%
1941	107,794*	11%*	21,500†	....

*—Nine months total.
†—January through March.



Stocks*

	Refined	Blister and Materials in Solution	Total
1930	307,500	....	....
1931	462,300	....	....
1932	502,000	....	....
1933	406,500	....	....
1934	284,500	....	....
1935	175,000	....	....
1936	110,000	....	....
1937	179,000	214,000	393,000
1938	181,000	233,000	414,000
1939	95,500	260,000	355,500
1940	91,500	243,000	334,500
1941	77,500	240,000	317,500

*—As of end of the year. Data from Minerals Year Book.

ALUMINUM — MAGNESIUM

Primary Aluminum*

(Short Tons)

	Production	Total Imports†	Total Exports†	Apparent Consumption	Ratio of U. S. Production to World Production
1930	114,518	14,230	8,665	70,932	.....
1931	88,735	7,416	2,350	58,497	36.0%
1932	52,469	4,092	2,218	34,844	31.0%
1933	42,549	7,623	2,853	51,269	27%
1934	37,088	9,296	4,183	68,281	20%
1935	59,644	10,646	1,985	95,823	21%
1936	112,466	12,781	803	137,722	28%
1937	146,340	22,589	2,692	167,979	27%
1938	143,441	8,870	6,309	89,523	22%
1939	163,545	14,336	37,085	167,645	22%
1940	206,280	18,084	27,841	227,017	23%
1941	307,500	9,768	5,123	....	.....

*—Bureau of Mines—"Minerals Year Book."
†—Includes scrap.

(In Pounds)

	Production	Sales	Imports	Exports	Apparent Consumption
1937	....	4,539,980	..	....	....
1938	6,433,390	4,819,617	*60	†2,100,000	2,719,700
1939	6,700,122	10,650,121	*76	†4,200,000	6,450,200
1940	12,521,726	12,823,633	..	1,668,765	11,154,868
1941	‡30,000,000	....	..	....	....
1942	‡76,500,000	....	..	....	....

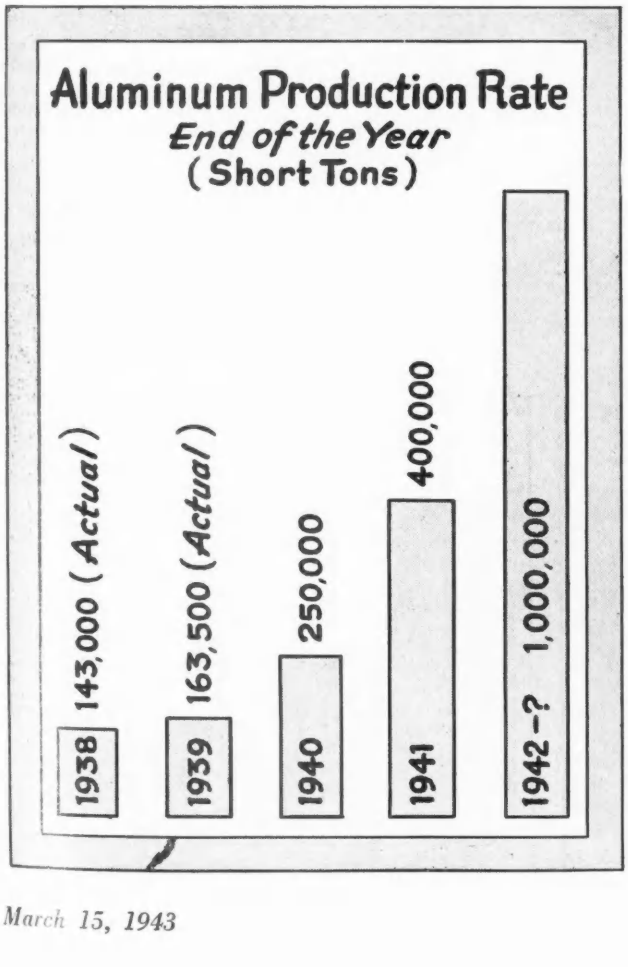
*—Includes alloy scrap. †—Estimated.
‡—Estimated capacity based on expansion of Dow Chemical Co. plants and new plant of Todd-Shipbuilding Corp.

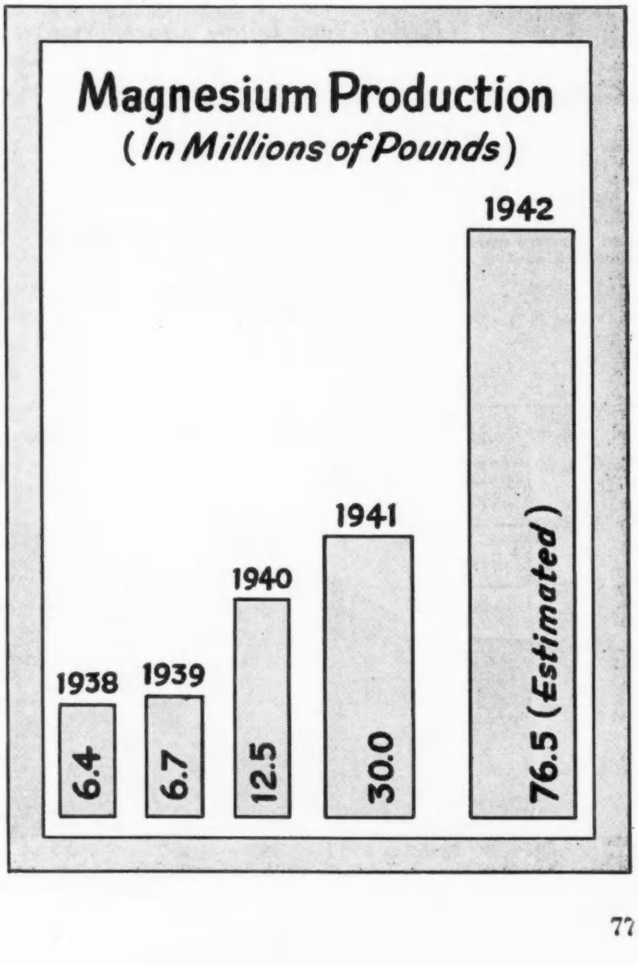
Consumption of Magnesium-Rich Alloy

Structural products	64%
Aluminum, zinc and other alloys	32%
Scavenger and deoxidizer	4%

Of Structural Products Sold or Used

Aircraft industry used	75%
Automotive industry used	10%
Portable machine and tool industry used	6%
Textile, foundry and others used	9%





LEAD

SUSTAINED domestic production of lead, plus imports substantially greater than normal, are supplying all war needs and building a government stock pile, Erwin Vogelsang, chief, WPB tin and lead branch revealed on October 21, 1942.

"Lead is practically unique among metals today, for it is the one important metal in which a shortage does not exist at the present time. However, control must be maintained to assure an adequate supply for any unforeseen requirements," he said.

Primary Refined Lead *

(Short Tons)

	PRIMARY LEAD REFINED PRODUCTION			Total Refined Primary Lead Produced	Imports of Refined Lead	Total Domestic Supply of Refined Lead (2)	Exports of Refined Primary Lead	Supply Available for Consumption (3)	Recovery of Secondary Lead	Apparent Consumption of All Lead, Primary and Secondary**
	From Domestic Ore and Base Bullion	From Foreign Ores	From Foreign Base Bullion							
1930.......	573,740	34,348	34,945	643,033	209	643,242	48,307	594,935	255,800	768,600
1931.......	390,260	22,254	30,250	442,764	....	....	21,514	....	234,700	567,700
1932.......	248,917	21,747	11,277	281,941	44	281,985	23,516	258,469	198,300	416,700
1933.......	249,713	7,677	6,286	263,676	63	263,739	22,835	240,904	224,500	449,500
1934.......	299,841	10,241	1,154	311,236	283	311,519	5,909	305,610	208,400	488,000
1935.......	310,505	13,659	396	324,560	1,322	325,882	6,982	318,900	270,400	538,900
1936.......	387,698	11,401	57	399,156	2,590	401,746	18,313	383,433	262,900	633,550
1937.......	443,142	23,393	782	467,317	2,238	469,555	20,091	449,464	275,100	678,700
1938.......	331,964	32,862	18,843	383,669	1,905	385,574	45,866	339,708	224,900	546,000
1939.......	420,967	24,652	38,416	484,035	5,388	489,423	74,392	415,031	241,500	687,000
1940.......	433,065	83,563	16,551	533,179	149,889	683,068	49,079	633,989	260,348	782,000
1941.......	470,517	74,166	26,284	570,967	179,086 (1)	750,053 (1)	13,494 (1)	736,559 (1)	397,146	1,050,000

*—Bureau of Mines, "Minerals Year Book."
**—American Bureau of Metal Statistics.
(1)—Total for nine months.
(2)—Excluding stocks on hand at beginning of year.
(3)—Not including stocks on hand.

Lead Stocks at Smelters and Refineries*

(End-of-Year Data—Short Tons)

	1936	1937	1938	1939	1940	1941
Refined pig head.............	165,159	119,837	102,489	52,783	32,458	15,973
Antimonial lead..............	6,697	9,294	13,413	5,994	8,468	4,212
	171,856	129,131	115,902	58,777	40,926	20,185
Lead in base bullion:						
At smelters and refiners.....	9,187	10,959	18,693	10,337	9,166	8,594
In transit to refineries.......	1,070	2,219	2,339	3,521	3,457	2,215
In process at refineries......	14,100	14,413	16,690	15,958	18,141	17,709
	24,357	27,591	37,722	29,816	30,764	28,518
Lead in ore and matte and in process at smelters.........	50,098	52,081	56,332	59,486	71,722	51,446
Total Stocks.............	246,311	208,803	209,956	148,079	143,412	100,149

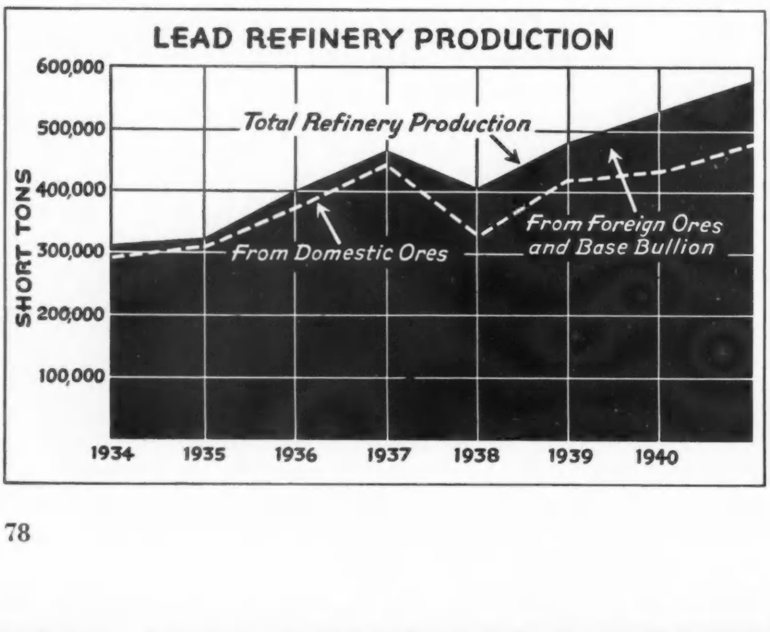
* Minerals Year Book as reported by American Bureau of Metal Statistics.

Pig Lead Exports*

(Short Tons)

	Total Pig Lead Exports to All Countries	Pig Lead Exported to Germany and Japan	Per Cent of Total U. S. Exports to Germany and Japan
1934....	5,909	4,454	75%
1835....	6,982	5,335	76%
1936....	18,313	8,631	48%
1937....	20,091	7,888	39%
1938....	45,866	31,295	68%
1939....	74,392	43,123	58%
1940....	23,755	11,958	50%
1941....	5,375 (1)	4,216 (1)	78% (1)

*—Minerals Year Book. (1)—Nine Months.



NICKEL*

(Short Tons)

	Primary U. S. Production	Secondary U. S. Production†	Imports All forms
1931........	373	2,070	17,899
1932........	195	1,450	10,765
1933........	126	1,650	26,480
1934........	157	1,850	29,298
1935........	160	1,950	37,848
1936........	107	1,965	53,136
1937........	219	2,400	54,435
1938........	416	2,300	29,530
1939........	394	2,920	64,638
1940........	554	.....	92,250

*—Bureau of Mines, "Minerals Year Book."
†—Recovered as metal and in nonferrous alloys and salts.

PETROLEUM

Gasoline Stocks*

(End-of-the-Year)
(Barrels)

	Finished at Refineries	Natural	Total Stocks ‡
1932	31,329,000	3,197,000	49,404,000
1933	29,971,000	3,311,000	52,616,000
1934	28,311,000	3,740,000	48,205,000
1935	31,328,000	3,698,000	50,647,000
1936	37,124,000	4,055,000	56,382,000
1937	46,234,000	4,758,000	69,892,000
1938	41,805,000	4,830,000	65,949,000
1939	51,920,000	4,421,000	77,301,000
1940	50,807,000	5,704,000	77,943,000
1941	56,325,000	4,275,000	86,159,000
†1942	44,623,000	4,996,000	64,224,000

*—Survey of Current Business.

†—End of November data.

‡—Finished, Unfinished and Natural Gasoline at refineries, bulk terminals and in transit.

Domestic Demand for Lubricating Oil*

(Thousands of Barrels)

Year	Automotive				Industrial	Total Demand
	Passenger Cars	Trucks	Busses	Total		
1936	......	......	......	10,716	11,607	22,323
1937	8,503	2,305	197	11,005	12,318	23,323
1938	8,195	2,185	199	10,579	10,654	21,233
1939	8,245	2,298	205	10,748	12,965	23,713
1940	8,390	2,327	213	10,930	13,760	24,690
1941	9,090	2,406	225	11,721	(1)	(1)

*—Minerals Year Book. (1)—Publication suspended.

Automotive Consumption of Lubricants*

(Thousands of Barrels)

Use	Passenger Cars		Trucks		Busses	
	1940	1941	1940	1941	1940	1941
Crankcase Oil	7,800	8,423	2,113	2,176	181	190
Transmission Oil	590	667	214	230	32	35
Total—Lubricating Oil	8,390	9,090	2,327	2,406	213	225
Chassis Greases	531	600	107	115	9	10
Total—Lubricants	8,921	9,690	2,434	2,521	222	235

*—Minerals Year Book.

Gasoline Consumption—by States*

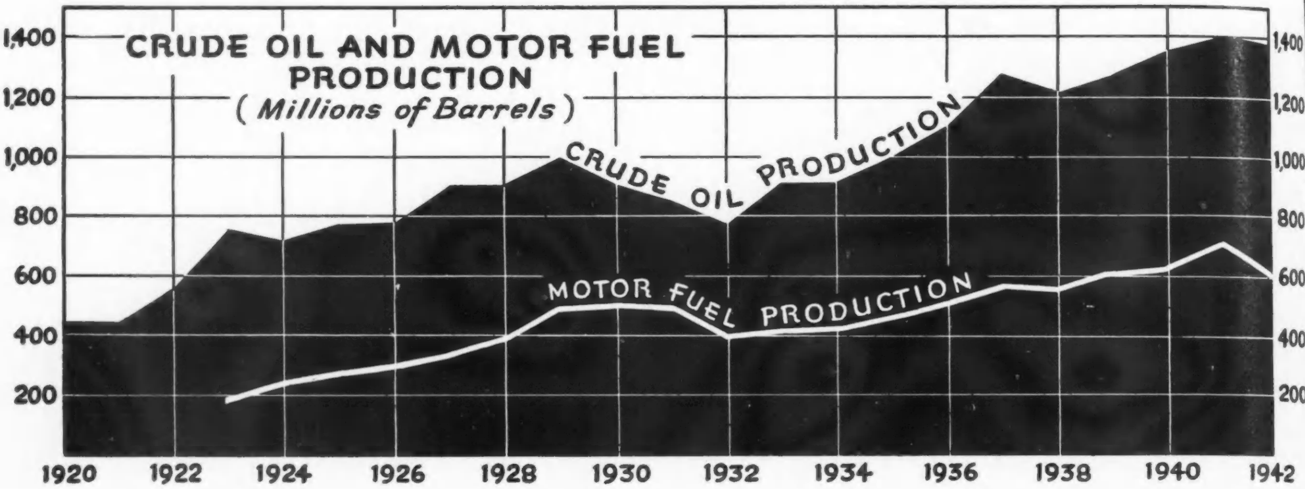
(Gallons—000 Omitted)

STATE	1938	1939	1940	1941	1942 †	Per Cent Change—1942 over 1941
Alabama	230,277	246,507	264,908	328,414	319,059	− 2.85
Arizona	102,526	107,114	110,716	128,157	128,790	.....
Arkansas	169,679	182,233	190,925	224,278	209,952	− 6.39
California	1,752,332	1,837,912	1,927,973	2,241,085	2,469,609	+10.19
Colorado	226,965	237,669	251,012	267,029	238,140	−10.82
Connecticut	326,262	345,105	380,876	421,468	342,144	−18.83
Delaware	55,776	58,428	62,799	68,118	55,647	−18.31
District of Columbia	139,291	149,978	169,127	191,552	155,520	−18.82
Florida	338,603	365,830	407,939	475,696	441,045	− 7.29
Georgia	338,787	358,292	392,550	449,933	356,967	−20.67
Idaho	94,700	100,270	106,992	117,011	109,593	− 6.34
Illinois	1,331,506	1,419,723	1,509,632	1,637,445	1,461,888	−10.73
Indiana	631,342	670,870	721,360	821,703	762,048	− 7.26
Iowa	528,091	550,333	572,755	612,269	560,358	− 8.48
Kansas	468,810	476,833	501,593	540,622	504,954	− 6.60
Kentucky	256,517	274,901	292,095	333,417	293,058	−12.11
Louisiana	247,370	261,240	278,339	343,508	281,880	−17.95
Maine	144,866	150,137	157,361	173,811	136,323	−21.57
Maryland	271,956	291,666	314,606	365,521	316,386	−13.45
Massachusetts	690,185	721,115	747,204	804,496	613,089	−23.80
Michigan	1,053,961	1,153,117	1,259,108	1,392,274	1,236,384	−11.20
Minnesota	529,731	550,677	582,155	608,213	560,601	− 7.83
Mississippi	193,860	209,493	219,202	258,833	256,122	− 1.05
Missouri	608,554	654,770	698,181	775,837	660,231	−14.91
Montana	117,604	126,521	137,591	148,387	130,491	−12.07
Nebraska	225,442	235,489	236,437	251,545	241,299	− 4.08
Nevada	38,665	43,880	43,799	49,753	53,460	+ 7.45
New Hampshire	85,156	92,578	95,827	102,038	73,386	−28.08
New Jersey	829,424	872,656	924,961	1,007,629	840,780	−16.56
New Mexico	96,362	101,946	110,465	122,194	100,116	−18.07
New York	1,802,216	1,900,716	1,970,554	2,058,071	1,616,193	−21.47
North Carolina	400,949	429,606	459,409	542,774	430,596	−20.67
North Dakota	127,298	131,739	152,784	165,782	175,446	+ 5.82
Ohio	1,278,825	1,371,266	1,470,921	1,639,314	1,506,843	− 8.09
Oklahoma	408,730	426,667	444,507	477,436	438,372	− 8.19
Oregon	229,684	244,677	262,512	303,646	286,740	− 5.57
Pennsylvania	1,403,587	1,482,428	1,581,974	1,704,947	1,418,391	−16.81
Rhode Island	120,988	129,878	133,964	147,280	119,070	−19.16
South Carolina	195,557	212,325	234,234	275,320	219,672	−20.22
South Dakota	129,335	133,292	143,712	152,624	145,800	− 4.48
Tennessee	280,860	288,737	326,967	385,816	363,771	− 5.72
Texas	1,270,370	1,340,893	1,419,858	1,673,237	1,788,723	+ 6.90
Utah	92,950	99,746	107,194	116,893	113,967	− 2.51
Vermont	64,324	68,018	70,807	75,189	54,918	−26.97
Virginia	355,170	382,097	417,603	497,356	411,156	−17.34
Washington	338,405	349,454	379,004	441,440	451,251	+ 2.22
West Virginia	190,396	204,917	221,005	240,188	198,045	−17.55
Wisconsin	542,464	566,724	590,070	636,223	588,303	− 7.54
Wyoming	61,844	68,011	70,060	79,049	63,423	−19.77
Total—United States	21,418,572	22,678,474	24,125,627	26,874,821	24,300,000	− 9.59

*—American Petroleum Institute. †—Partly estimated by Automotive and Aviation Industries.

MATERIALS

PETROLEUM

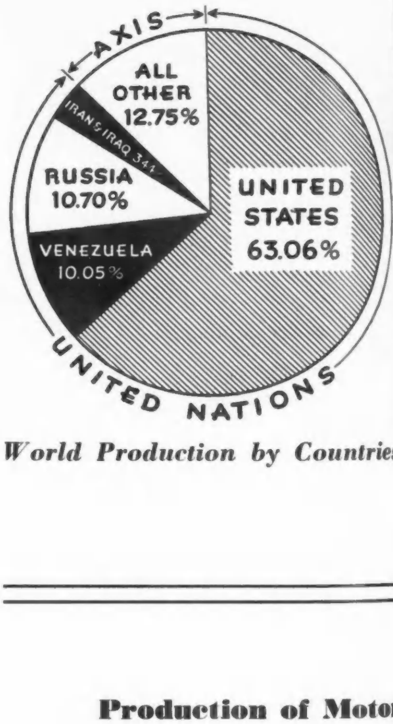


World Production of Crude Petroleum*

Thousands of Barrels

Country	1937	1938	1939	1940	1941	Per Cent of Total-1941
North America						
Canada	2,944	6,966	7,838	8,591	10,125	.45
Mexico	46,907	38,506	42,898	44,036	43,837	1.97
Trinidad	15,503	17,737	19,270	20,219	21,211	.95
United States	1,279,160	1,214,355	1,264,962	1,353,214	1,404,182	63.06
Other North America	33	78	112	142	150	.01
Total—North America	1,344,547	1,277,642	1,335,080	1,426,202	1,479,505	66.44
South America						
Argentina	16,355	17,076	18,613	20,609	21,763	.98
Bolivia	122	226	215	288	230	.01
Columbia	20,599	21,582	23,857	25,593	24,553	1.10
Ecuador	2,161	2,246	2,313	2,349	1,557	.07
Peru	17,457	15,839	13,508	12,126	11,922	.53
Venezuela	186,230	188,174	206,470	185,570	223,784	10.05
Total—South America	242,924	245,143	264,976	246,535	283,809	12.74
Europe						
Albania	619	752	934	1,497	1,381	.06
Czechoslovakia	123	130	120	119	109	§
France	502	513	500	496	479	.02
Germany	3,176	3,861	4,487	4,544	4,438	.20
Austria	221	383	693	719	692	.03
Hungary	16	288	1,103	1,755	2,474	.11
Italy	110	101	91	57	46	§
Poland	3,716	3,763	3,898	3,891	3,319	.15
Rumania	52,452	48,487	45,483	42,182	38,147	1.71
U.S.S.R.†	193,241	204,956	216,866	218,600	238,150	10.70
Other Europe	4	9	10	10	10	§
Total—Europe†	254,180	263,243	274,185	273,870	289,245	12.9
Asia						
Bahrein Island	7,762	8,298	7,589	7,074	6,794	.31
Burma	7,848	7,538	7,873	7,731	7,762	.35
India, British	2,162	2,488	2,327	2,250	2,270	.10
Iran (Persia)	77,804	78,372	78,151	66,900	64,000	2.87
Iraq	31,836	32,643	30,791	24,225	12,650	.57
Japan (incl. Taiwan)	2,488	2,511	2,654	2,639	2,659	.12
Netherlands Indies	56,724	57,318	62,087	62,011	53,704	2.41
Sakhalin	3,656	3,821	4,000	4,000	4,000	.18
Sarawak and Brunei	6,009	6,913	7,097	7,047	6,864	.31
Saudi Arabia	65	495	3,934	5,365	5,871	.26
Total—Asia‡	196,354	200,397	206,503	189,242	166,574	7.48
Africa						
Egypt	1,196	1,581	4,666	6,053	7,659	.35
Other Africa	22	27	27	27	27	.....
Total Africa	1,218	1,608	4,693	6,080	7,686	.35
Australia and New Zealand	4	4	3	3	3	.....
Undistributed	4	4	4	14	14	.....
World Total	2,039,231	1,988,041	2,085,444	2,141,946	2,226,836	100.00

*—Minerals Year Book—Compiled by B. B. Waldbauer.
†—Includes U.S.S.R. fields in Asia other than Sakhalin.
‡—Exclusive of U.S.S.R. fields in Asia, which are included with U.S.S.R. in Europe.
§—Total equals approximately .01 per cent.



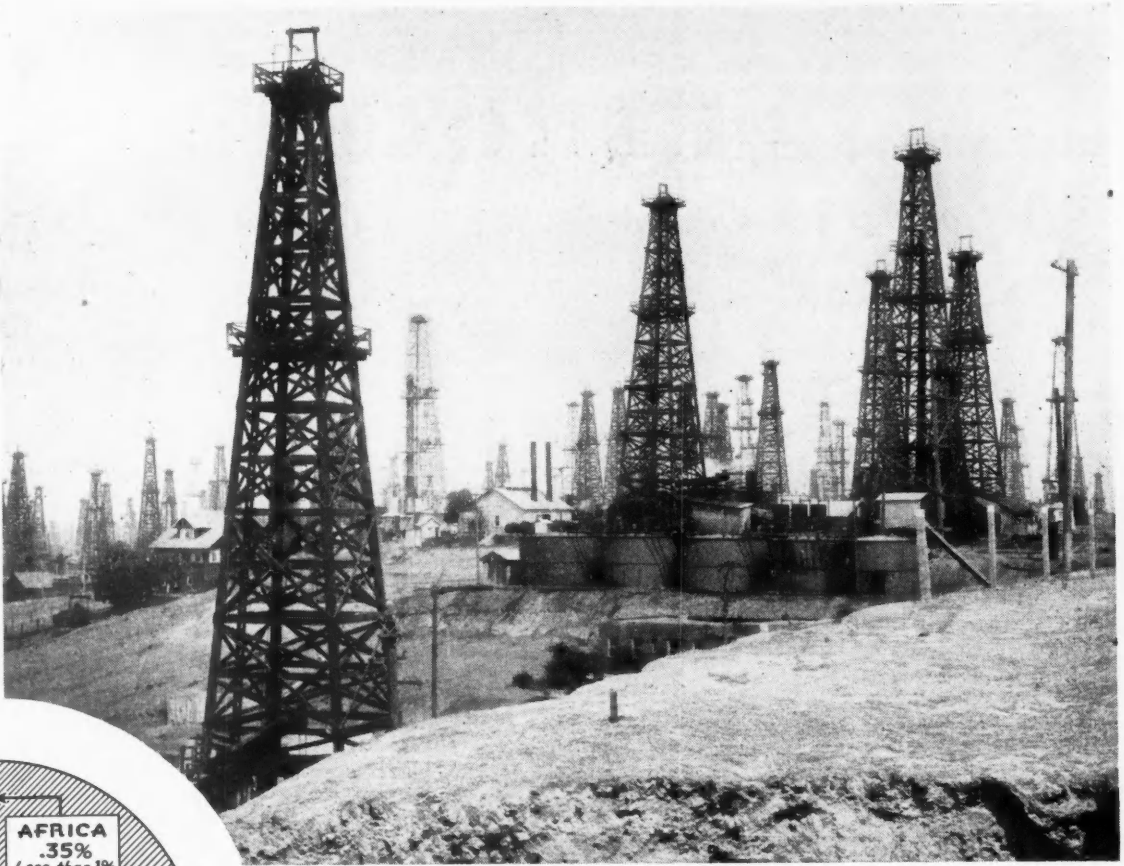
World Production by Countries

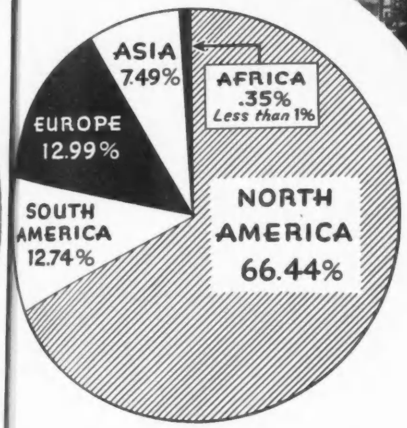
Production of Motor

Thousands

	1936	1937
Motor Fuel		
Production	516,266	571,727
Imports	78	144
Exports	28,646	38,306
Stocks, end of period	60,437	74,650
Domestic demand	481,606	519,352
Lubricating Oil		
Production	30,927	35,321
Imports	4	7
Exports	8,691	10,975
Stocks, end of period	6,482	7,512
Domestic demand	22,323	23,323

*—Minerals Year Book.
†—January through September.
‡—Figures not available.





World Production by Continents

Fuel and Lubricating Oil*

of Barrels

937	1938	1939	1940	1941	1942§
,727	569,162	611,043	616,695	690,958	590,000
144	79	47	97	†596	‡
306	50,109	44,638	25,377	†16,005	‡
650	70,779	81,722	83,647	90,688	‡
352	523,003	555,509	589,490	‡	‡
321	30,826	35,036	36,765	39,539	38,600
7	7	5	11	†	‡
975	9,417	11,881	10,461	†6,920	‡
512	7,695	7,142	8,767	8,127	‡
323	21,233	23,713	24,690	‡	‡

§—Estimate based on eleven months total.

Estimates of Proved Oil Reserves in U. S.*

By States, as of January 1

Millions of Barrels

State	1935†	1937†	1938†	1939†	1940†	1941†	1942‡
Eastern States							
Illinois	37	28	59	432	382	315	334
Indiana	5	3	7	6	14	14	23
Kentucky	50	39	38	49	44	41	36
Michigan	64	63	46	74	51	35	56
New York	75	66	45	40	35	65	60
Ohio	40	32	30	33	32	30	37
Pennsylvania	340	307	218	200	183	188	171
West Virginia	40	32	28	50	46	53	50
Total	651	570	471	884	787	741	767
Central and Southern States							
Arkansas	103	87	171	332	320	306	295
Kansas	390	590	607	763	726	692	690
Louisiana	513	657	1,049	1,180	1,173	1,216	1,330
Mississippi	......	......	......	......	7	40	80
New Mexico	451	581	739	703	687	692	675
Oklahoma	1,235	1,384	1,311	1,206	1,063	1,002	1,036
Texas	6,643	8,343	9,692	10,180	9,768	10,624	10,976
Total	9,335	11,642	13,569	14,364	13,744	14,572	15,082
Mountain States							
Colorado	16	19	19	22	20	23	23
Montana	102	115	109	99	94	89	86
Wyoming	267	260	280	327	306	305	304
Total	385	394	408	448	420	417	413
Pacific Coast—California	3,261	3,251	3,303	3,710	3,532	3,291	3,323
Other States	......	......	......	......	......	4	4
Total—United States	13,632	15,857	17,751	19,406	18,483	19,025	19,589

*—From reports of Committee on Petroleum Reserves, American Petroleum Institute.—Minerals Year Book, 1941.
†—Final revised estimates of the amount of crude oil that may be extracted by present methods from fields completely developed or sufficiently explored to permit reasonably accurate calculations.
‡—Subject to revision.

RUBBER

The Baruch Committee Program

(Long Tons per Year)

	August, 1942 Program	Additional Recommended Capacity	Total Recommended Capacity
Buna S	705,000	140,000	845,000
Neoprene	40,000	20,000	60,000
Butyl	132,000	....	132,000
Total	877,000	160,000	1,037,000

Present Synthetic Program Now Building—U.S. Only*

(Long Tons)

	Baruch Report Recommendations	Now Building (Rated Capacity)	% of Recommendations now Building
Buna S	845,000	705,000	83
Neoprene	60,000	40,000	67
Butyl	132,000	68,000	52
Total	1,037,000	813,000	78

*—Office of Rubber Director.

Capacities of Plants Under Directives for Parts and Materials

(Rated Capacities in Long Tons)

	Baruch Report Recommendations	Now Under Directives†	% of Baruch Report Required Capacity now under Directives
Buna S	845,000	435,000	51.5
Butyl	132,000	7,000	5.3
Neoprene	60,000	10,000	16.6
Total	1,037,000	452,000	43.6

*—Office of Rubber Director.
†—These include plants now built or finishing without directions.

Estimated Essential Requirements U.S. and Canada for 1943*

(Long Tons)

U. S. Military	312,500
Commercial Vehicles	65,000
Industrial, Other Military and Civilian	41,000
Canadian	47,500
Export (as finished goods)	105,000
British Deficiency (Buna S)	41,290
Total Essential Requirements	612,290

*—Office of Rubber Director—Does not include private passenger car requirements.

Reclaimed Rubber

(Tons—2240 lbs.)

	Consumption	Production
1929	217,020	214,284
1930	153,456	160,128
1931	123,000	129,684
1932	77,504	75,765
1933	85,003	93,586
1934	100,855	107,765
1935	117,523	119,906
1936	141,486	150,571
1937	162,000	185,000
1938	120,800	122,400
1939	182,603	195,243
1940	187,977	190,304
1941	212,940*	228,524*

*—January through October.

Approximate Pneumatic Casing Production

1922	40,932,000	1932	40,080,000
1923	45,264,000	1933	45,300,000
1924	51,636,000	1934	47,232,000
1925	60,852,000	1935	49,356,000
1926	61,608,000	1936	56,040,000
1927	64,440,000	1937	53,310,000
1928	77,940,000	1938	40,184,000
1929	68,724,000	1939	57,613,000
1930	50,964,000	1940	59,186,000
1931	48,744,000	1941	61,532,000

Stocks on Hand as of Dec. 31

(Tons—2240 lbs.)

1923	72,920	1933	365,000
1924	56,080	1934	355,000
1925	51,215	1935	303,000
1926	72,510	1936	223,000
1927	99,282	1937	262,200
1928	65,454	1938	231,500
1929	122,062	1939	138,020
1930	201,000	1940	288,864
1931	322,000	1941	*454,711
1932	379,000	1942	†440,000

*—End of October figure.
†—U.S. and Canada.

Estimated Quarterly Production of Synthetic Rubber—1943*

(Long Tons)

	Quarters 1	2	3	4	Total
Buna S	3,800	13,900	59,500	118,000	195,200
Butyl	100	1,500	3,300	13,500	18,400
Neoprene	4,400	4,900	9,100	12,000	30,400
Buna N	2,900	3,900	4,800	4,800	16,400
Total Synthetic	11,200	24,200	76,700	148,300	260,400
Crude Equivalent	10,800	22,900	70,700	136,600	241,000

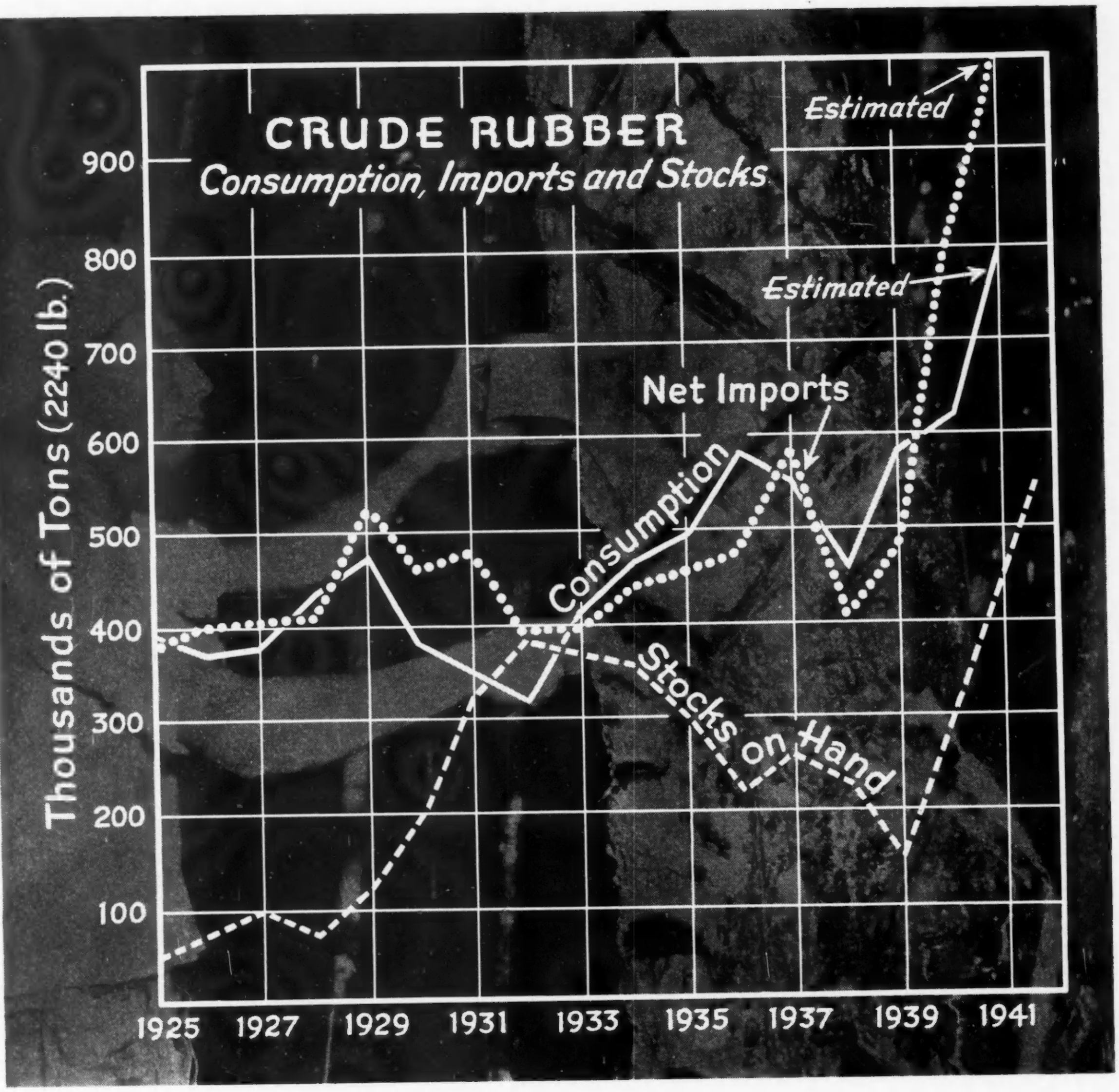
*—Office of Rubber Director.

Estimated Requirements—Supply—Stocks, U.S. and Canada*

(In Thousands of Long Tons in Terms of Crude Equivalent)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Requirements	47	95	142	190	237	286	340	394	448	502	557	612	667	722	777
Supply	9	21	29	37	46	57	75	100	134	175	223	276	334	397	464
Stocks	402	366	327	287	249	211	175	146	126	113	106	104	107	115	127

*—Resultant Stocks obtained by subtracting difference between Requirements and Supply from Initial Stocks of 440,000 tons.



Consumption of Crude Rubber in the United States

(Long Tons)

	Total Consumption	Per Cent Consumed for Tires and Tubes
1921	169,308	76
1922	283,272	71
1923	319,704	68
1924	328,764	82
1925	388,476	85
1926	366,156	82
1927	372,996	80
1928	437,004	83
1929	467,400	81
1930	375,996	78
1931	355,188	77
1932	336,744	73
1933	412,368	71
1934	462,480	69
1935	491,544	71
1936	575,000	71
1937	543,599	71
1938	437,031	66
1939	577,591	71
1940	618,349	71
1941	805,000*	..

* Estimated.

U. S. Crude Rubber Imports

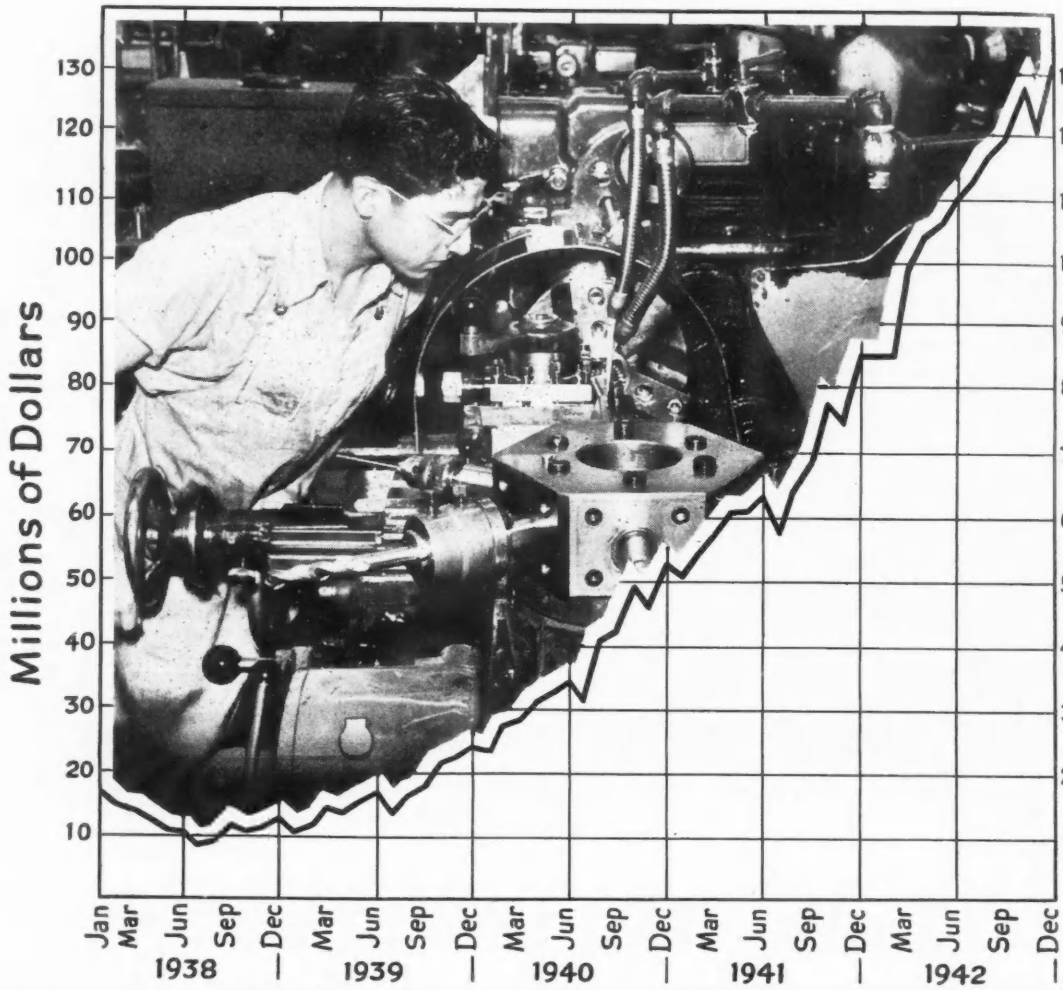
	Imports	Reexports	Net Imports	Per Cent of World Production
	Long Tons			
1920	253,681	4,160	249,521	73.0
1921	185,452	5,716	179,736	59.6
1922	301,077	4,809	296,268	72.9
1923	309,145	8,772	300,373	73.5
1924	329,412	10,309	319,103	74.9
1925	400,423	14,827	385,596	73.0
1926	417,643	17,671	399,972	64.3
1927	431,246	27,775	403,471	66.5
1928	439,731	32,159	407,572	62.3
1929	565,087	36,485	528,602	61.2
1930	487,628	30,205	457,423	55.7
1931	501,788	25,609	476,179	59.5
1932	414,668	20,937	393,731	55.6
1933	418,902	20,576	398,326	46.7
1934	463,018	23,856	439,162	43.1
1935	467,146	11,390	455,756	52.2
1936	488,145	12,581	475,564	55.4
1937	600,476	7,948	592,528	52.0
1938	412,092	5,652	406,440	45.4
1939	499,616	13,125	486,491	48.4
1940	818,242	7,060	811,182	58.3
1941	763,987*	......	....	....

*—Nine Months.

GENERAL INDUSTRIAL

MACHINE T

Dollar Volume of Machine Tool Shipments By Months—1937-1942

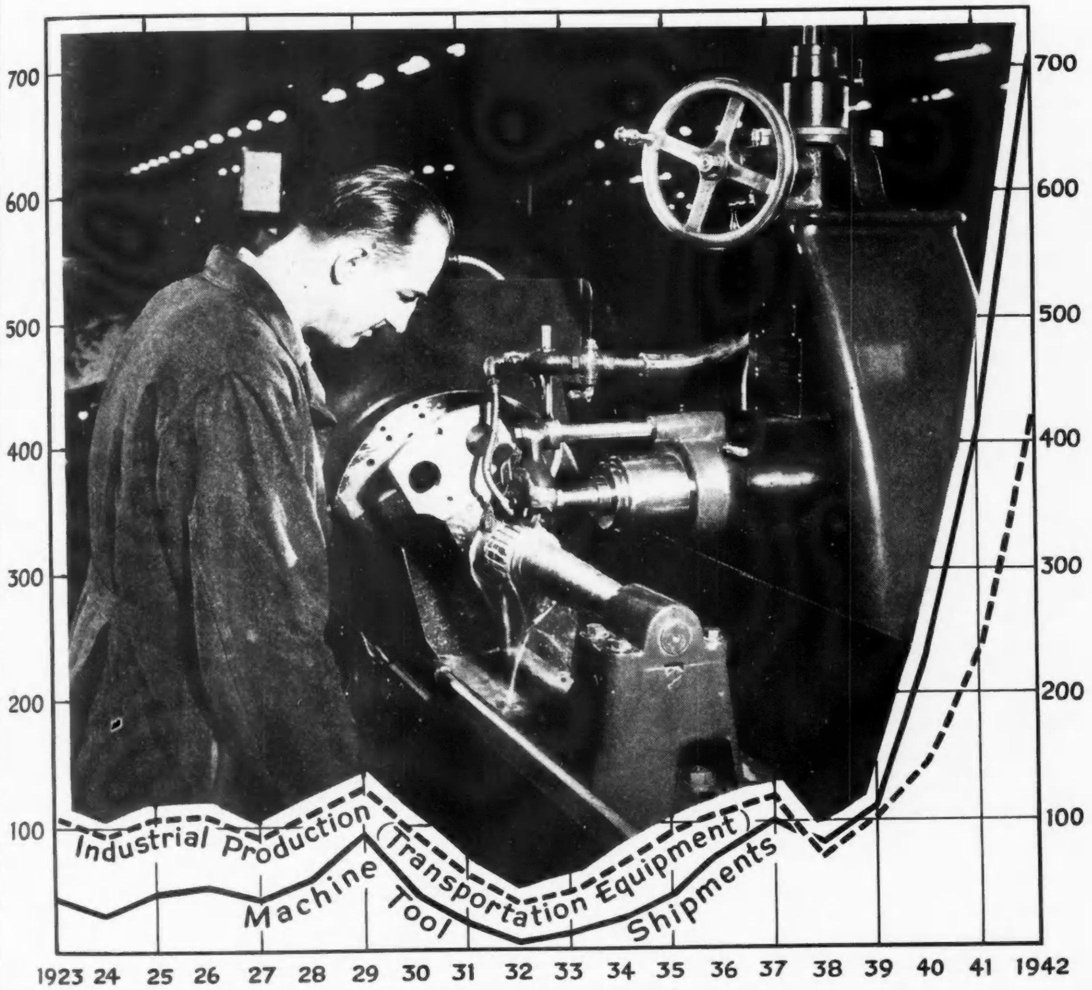


Monthly Dollar Volume of Machine Tool Shipments*

	1937	1938	1939	1940	1941	1942
January	$10,230,000	$15,928,000	$10,697,000	$24,092,000	$50,725,000	$85,100,000
February	12,579,000	14,095,000	11,846,000	27,836,000	54,705,000	85,100,000
March	15,995,000	13,379,000	14,312,000	28,887,000	57,400,000	99,000,000
April	15,828,000	12,029,000	14,046,000	31,145,000	60,300,000	104,000,000
May	15,878,000	10,813,000	15,578,000	32,846,000	60,800,000	105,600,000
June	17,294,000	10,330,000	16,978,000	34,614,000	63,400,000	110,000,000
July	16,195,000	8,231,000	13,846,000	31,468,000	57,900,000	113,000,000
August	15,978,000	9,997,000	16,795,000	40,870,000	64,300,000	116,450,000
September	17,978,000	11,213,000	18,044,000	42,321,000	68,700,000	119,600,000
October	18,794,000	10,763,000	21,167,000	49,455,000	77,200,000	128,800,000
November	16,511,000	11,180,000	22,261,000	46,423,000	74,600,000	119,000,000
December	15,828,000	12,563,000	24,379,000	52,675,000	85,100,000	131,600,000
Total	$189,088,000	$140,521,000	$199,949,000	$442,632,000	$775,130,000	$1,317,250,000

* National Machine Tool Builders Association.

Indexes of Machine Tool Shipments and Production of Transportation Equipment—By Years



Estimated Dollar Volume of Machine Tool Shipments*

Year	Dollar Volume	Year	Dollar Volume
1919	$160,000,000	1931	$ 51,000,000
1920	124,000,000	1932	22,000,000
1921	23,000,000	1933	25,000,000
1922	46,700,000	1934	50,000,000
1923	82,000,000	1935	85,000,000
1924	57,400,000	1936	133,000,000
1925	91,500,000	1937	189,100,000
1926	105,000,000	1938	140,500,000
1927	87,000,000	1939	200,000,000
1928	128,000,000	1940	442,600,000
1929	185,000,000	1941	775,000,000
1930	96,000,000	1942	1,317,000,000

Indexes of Machine Tool Shipments and Production of Transportation Equipment

1935-1939 = 100

Year	Machine Tool Shipments	Industrial Production (Transportation Equipment)	Year	Machine Tool Shipments	Industrial Production (Transportation Equipment)
1919	84	...	1931	27	62
1920	65	...	1932	12	38
1921	12	...	1933	13	48
1922	25	...	1934	26	69
1923	43	110	1935	45	93
1924	30	94	1936	70	110
1925	48	106	1937	103	123
1926	55	109	1938	77	72
1927	46	89	1939	105	103
1928	68	108	1940	232	145
1929	98	134	1941	410	234
1930	51	91	1942	700	417

Estimated Corporate Profits

ALL DATA IN MILLIONS OF DOLLARS

Source—National Income Uni

Corporate Profits Before Taxes

INDUSTRY	Profits before Federal Taxes 1939	1940	1941	1942
Total	5,460	8,388	14,608	19,700
Agriculture	20	26	39	53
Mining	83	186	261	305
Manufacturing	3,222	5,064	9,246	12,406
Food, beverage and tobacco	617	675	938	1,197
Textiles and leather	220	279	618	831
Lumber and products	55	126	267	366
Paper and printing	205	322	503	554
Chemicals	466	604	903	958
Oil refining	77	161	259	262
Stone, clay and glass	140	197	319	302
Metals	954	1,987	4,182	6,480
Autos and accessories	322	516	867	1,035
Rubber and miscellaneous	166	197	390	421
Trade	764	1,069	1,562	1,900
Wholesale	321	459	676	750
Retail	443	610	886	1,150
Contract Construction	25	63	201	270
Transportation	419	677	1,222	2,309
Power and Gas	509	648	962	1,082
Communications	229	242	289	350
Finance	337	423	705	825
Service	78	119	204	250
Miscellaneous *	−226	−129	−83	−50

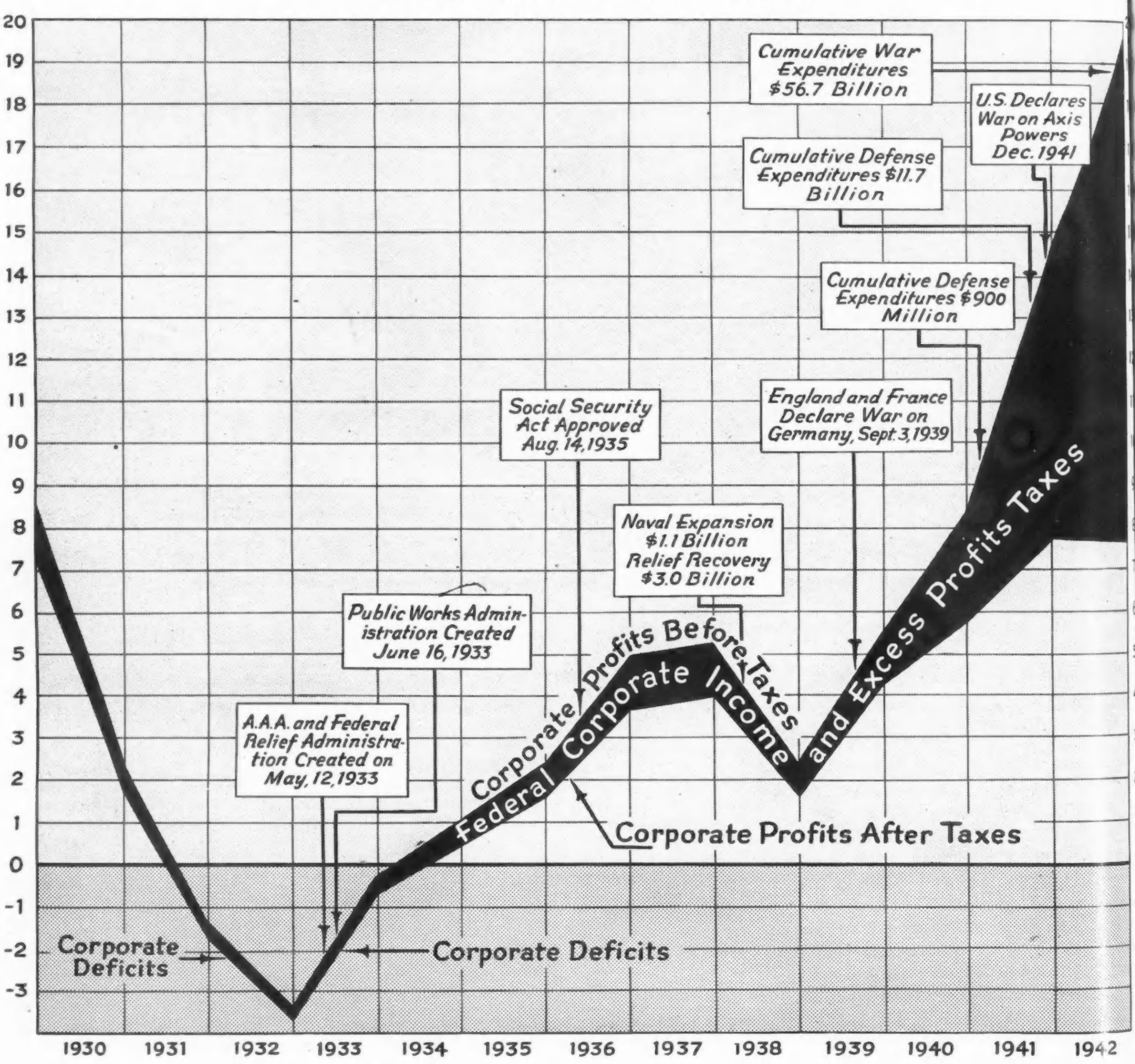
*—Includes adjustment for international flow of dividends.

Federal Income and Excess Profits Taxes

INDUSTRY	Federal Income and Excess Profits Taxes 1939	1940	1941	1942
Total	1,232	2,544	6,940	[illegible]
Agriculture	5	9	18	[illegible]
Mining	37	72	116	[illegible]
Manufacturing	634	1,533	4,792	[illegible]
Food, beverage and tobacco	114	172	368	[illegible]
Textiles and leather	50	86	293	[illegible]
Lumber and products	16	39	140	[illegible]
Paper and printing	45	92	232	[illegible]
Chemicals	84	183	446	[illegible]
Oil refining	23	47	97	[illegible]
Stone, clay and glass	26	57	153	[illegible]
Metals	183	653	2,418	[illegible]
Autos and accessories	62	141	441	[illegible]
Rubber and miscellaneous	31	63	204	[illegible]
Trade	167	302	699	[illegible]
Wholesale	69	130	317	[illegible]
Retail	98	172	382	[illegible]
Contract Construction	11	24	106	[illegible]
Transportation	68	128	311	[illegible]
Power and Gas	93	159	344	[illegible]
Communications	44	64	112	[illegible]
Finance	71	91	188	[illegible]
Service	30	44	93	[illegible]
Miscellaneous *	72	118	161	[illegible]

†—Figures for 1941 and 1942 are subject to revision.

The Increasing Rate of Corporate Taxation (Billions of Dollars).



Before and After Federal Taxes†

Department of Commerce

ALL DATA IN MILLIONS OF DOLLARS

Corporate Profits After Taxes

INDUSTRY	Profits after Federal Taxes			
	1939	1940	1941	1942
Total	4,228	5,844	7,668	7,600
Agriculture	15	17	21	31
Mining	46	114	145	126
Manufacturing	2,588	3,531	4,454	3,989
Food, beverage and tobacco	503	503	570	563
Textiles and leather	170	193	325	293
Lumber and products	39	87	127	95
Paper and printing	160	230	271	179
Chemicals	382	421	457	368
Oil refining	54	114	162	141
Stone, clay and glass	114	140	166	100
Metals	771	1,334	1,764	1,712
Autos and accessories	260	375	426	375
Rubber and miscellaneous	135	134	186	163
Trade	597	767	863	837
Wholesale	252	329	359	300
Retail	345	438	504	537
Contract Construction	14	39	95	120
Transportation	351	549	911	1,357
Power and Gas	416	489	618	526
Communications	185	178	177	149
Finance	266	332	517	575
Service	48	75	111	125
Miscellaneous *	−298	−247	−244	−235

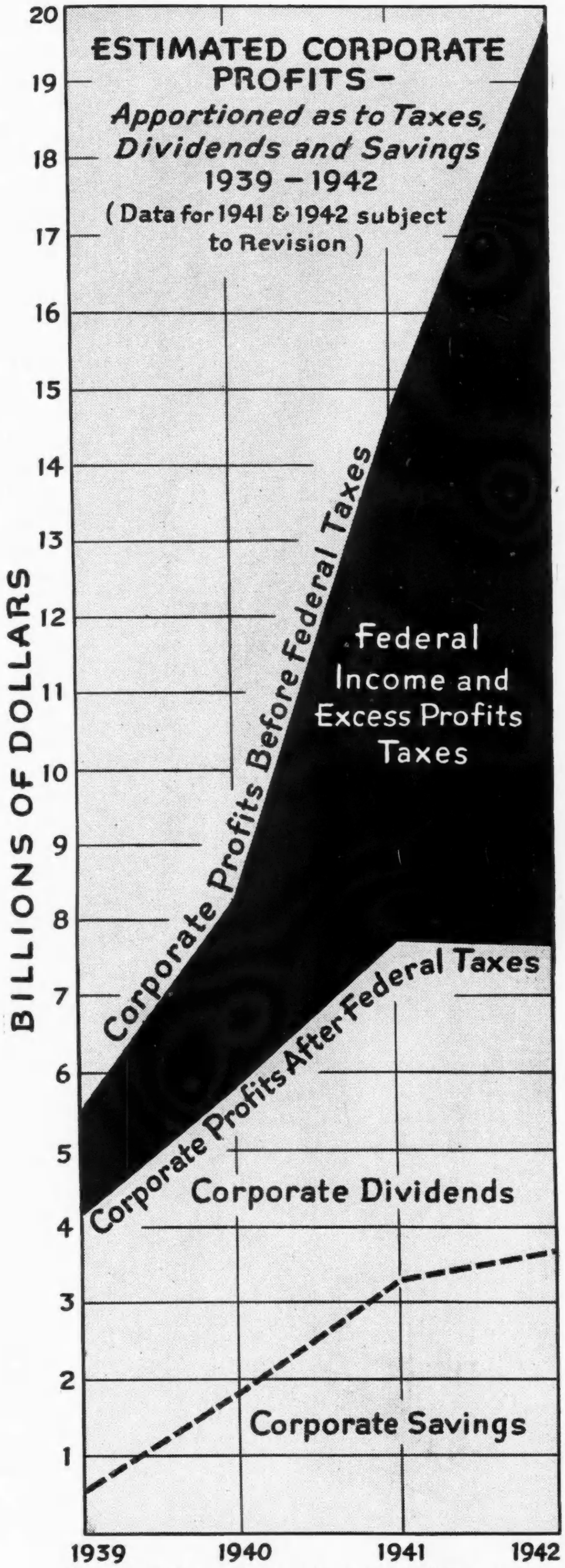
Corporate Dividends

INDUSTRY	Net Dividends Paid			
	1939	1940	1941	1942
Total	3,806	4,046	4,403	3,953
Agriculture	15	17	21	31
Mining	177	240	291	270
Manufacturing	1,842	2,026	2,127	1,759
Food, beverage and tobacco	371	366	384	350
Textiles and leather	109	114	120	114
Lumber and products	49	62	65	55
Paper and printing	125	133	140	57
Chemicals	260	266	279	233
Oil refining	82	84	88	75
Stone, clay and glass	82	93	98	79
Metals	504	635	667	599
Autos and accessories	175	203	213	136
Rubber and miscellaneous	85	70	73	61
Trade	459	465	564	580
Wholesale	170	164	199	194
Retail	289	301	365	386
Contract Construction	22	23	28	29
Transportation	259	282	358	365
Power and Gas	484	482	475	423
Communications	175	175	170	166
Finance	418	443	453	409
Service	76	79	96	91
Miscellaneous *	−121	−186	−180	−170

Corporate Savings

INDUSTRY	Corporate Savings			
	1939	1940	1941	1942
Total	422	1,798	3,265	3,647
Agriculture	.....	.....	.....	.....
Mining	−131	−126	−146	−144
Manufacturing	746	1,505	2,327	2,230
Food, beverage and tobacco	132	137	186	213
Textiles and leather	61	79	205	179
Lumber and products	−10	25	62	40
Paper and printing	35	97	131	122
Chemicals	122	155	178	135
Oil refining	−28	30	74	66
Stone, clay and glass	32	47	68	21
Metals	267	699	1,097	1,113
Autos and accessories	85	172	213	239
Rubber and miscellaneous	50	64	113	102
Trade	138	302	299	257
Wholesale	82	165	160	106
Retail	56	137	139	151
Contract Construction	−8	16	67	91
Transportation	92	267	553	992
Power and Gas	−68	7	143	103
Communications	10	3	7	−17
Finance	−152	−111	64	166
Service	−28	−4	15	34
Miscellaneous *	−177	−61	−64	−65

* — Includes adjustment for international flow of dividends.
† — Figures for 1941 and 1942 are subject to revision.



Source: National Income Unit, Dept. of Commerce

Hourly and Weekly Wages

Earnings and Hours Worked in Manufacturing Industries

Source: National Industrial Conference Board

25 MANUFACTURING INDUSTRIES

	Average Earnings		Average Actual Hours per Week per Wage Earner
	Hourly	Weekly	
1929	$.590	$28.55	48.3
1930	.589	25.84	43.9
1931	.564	22.62	40.4
1932	.498	17.05	34.8
1933	.491	17.71	36.4
1934	.580	20.06	34.7
1935	.599	22.23	37.2
1936	.619	24.39	39.5
1937	.695	26.80	38.7
1938	.716	24.43	34.3
1939	.720	27.04	37.6
1940	.739	28.54	38.6
1941	.814	33.62	41.2
1942	.923	40.03	43.0
1941			
January	.759	30.61	40.2
February	.764	31.41	41.0
March	.769	31.80	41.2
April	.784	31.89	40.7
May	.799	33.12	41.3
June	.818	34.26	41.7
July	.822	33.70	41.0
August	.828	34.10	41.2
September	.845	35.10	41.6
October	.853	35.65	41.7
November	.860	35.74	41.5
December	.868	36.08	41.6
1942			
January	.878	37.47	42.4
February	.880	37.53	42.4
March	.888	38.14	42.7
April	.895	38.68	42.8
May	.906	39.00	42.7
June	.917	39.52	42.7
July	.928	39.80	42.6
August	.940	40.87	43.2
September	.957	41.79	43.4
October	.958	42.10	43.6
November	.966	42.50	43.7
December	.970	42.99	44.2

Note—Hourly Earnings are not Wage Rates because they include overtime and incentive payments.

AUTOMOBILE INDUSTRY*

	Average Earnings		Average Actual Hours per Week per Wage Earner
	Hourly	Weekly	
1929	$.695	$32.48	46.8
1930	....	.....	....
1931	....	.....	....
1932	.609	18.50	30.4
1933	.609	21.84	36.0
1934	.715	23.69	33.2
1935	.752	28.04	37.4
1936	.791	29.81	37.7
1937	.916	32.31	35.3
1938	.953	30.77	32.3
1939	.953	33.26	34.9
1940	.971	36.22	37.3
1941	1.086	42.33	39.0
1942	1.248	55.55	44.4
1941			
January	.992	38.19	38.5
February	.997	40.88	41.0
March	1.005	41.31	41.1
April	1.017	36.92	36.3
May	1.077	43.62	40.5
June	1.108	47.31	42.7
July	1.109	40.37	36.4
August	1.102	41.77	37.9
September	1.126	41.89	37.2
October	1.145	45.91	40.1
November	1.172	46.41	39.6
December	1.186	43.41	36.6
1942			
January	1.251	54.17	42.8
February	1.244	54.49	43.1
March	1.246	56.69	45.6
April	1.242	56.14	45.2
May	1.245	56.27	44.9
June	1.237	54.80	44.3
July	1.241	54.11	43.6
August	1.235	56.65	45.9
September	1.260	55.28	43.9
October	1.239	56.52	45.6
November	1.273	57.44	45.1
December	1.267	54.13	42.7

*—Based on data collected by the Automobile Manufacturers Association and the Conference Board.

Wholesale Commodity Prices

Index Numbers 1926=100.

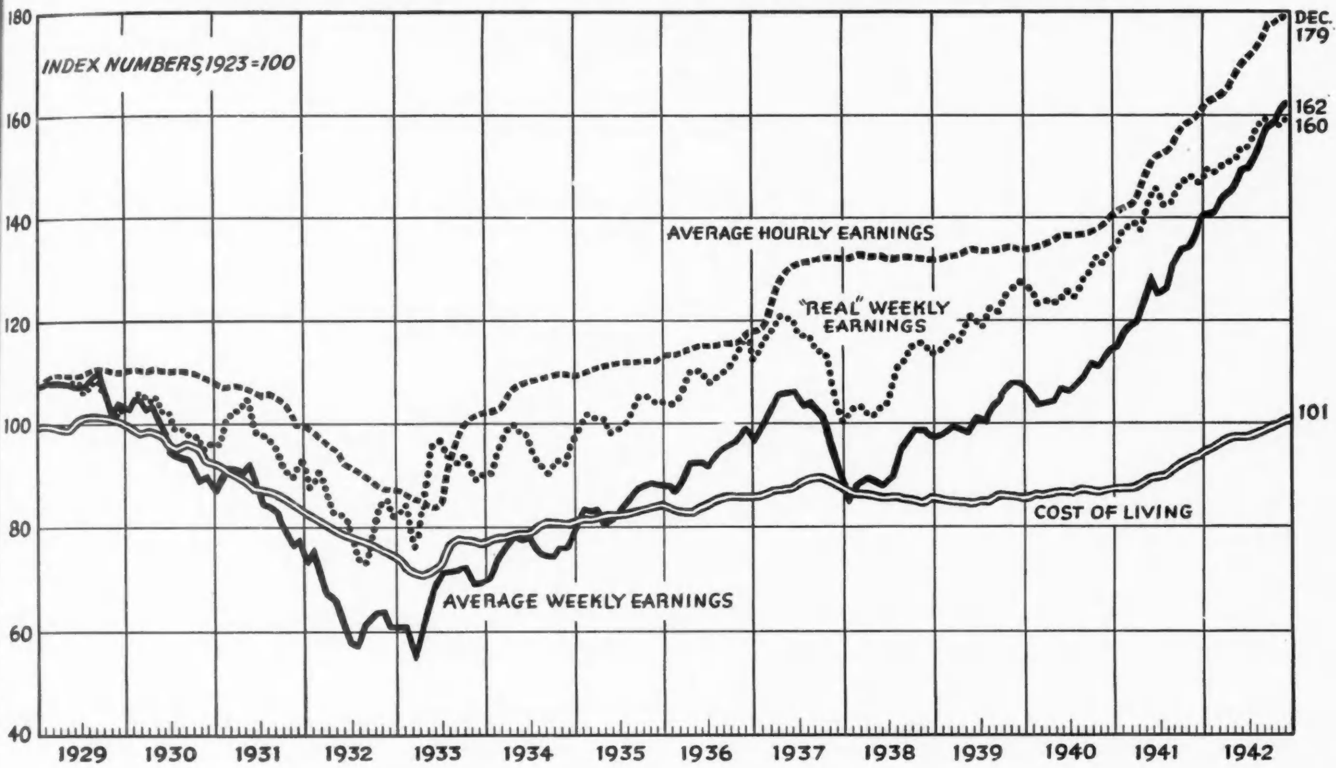
Year and Month	Composite All Commodities	Farm Products	Foods	Hides and Leather Products	Textile Products	Fuel and Lighting	Metals and Metal Products	Building Materials	Chemicals and Allied Products	House Furnishing Goods	Miscellaneous
1929	95.3	104.9	99.9	109.1	90.4	83.0	100.5	95.4	94.0	94.3	82.6
1930	86.4	88.3	90.5	100.0	80.3	78.5	92.1	89.9	88.7	92.7	77.7
1931	73.0	64.8	74.6	86.1	66.3	67.5	84.5	79.2	79.3	84.9	69.8
1932	64.8	48.2	61.0	72.9	54.9	70.3	80.2	71.4	73.9	75.1	64.4
1933	65.9	51.4	60.5	80.9	64.8	66.3	79.8	77.0	72.1	75.8	62.5
1934	74.9	65.3	70.5	86.6	72.9	73.3	86.9	86.2	75.3	81.5	69.7
1935	80.0	78.8	83.7	89.6	70.9	73.5	86.4	85.3	79.0	80.6	68.3
1936	80.8	80.9	82.1	95.4	71.5	76.2	87.0	86.7	78.7	81.7	70.5
1937	86.3	86.4	85.5	104.6	76.3	77.6	95.7	95.2	82.6	89.7	77.8
1938	78.6	68.5	73.6	92.8	66.7	76.5	95.7	90.3	77.0	86.8	73.3
1939	77.1	65.3	70.4	95.6	69.7	73.1	94.4	90.5	76.0	86.3	74.8
1940	78.6	67.7	71.3	100.8	73.8	71.7	95.8	94.8	77.0	88.5	77.3
1941	87.3	82.4	82.7	108.3	84.8	76.2	99.4	103.2	84.6	94.3	82.0
1942	98.7	105.8	99.5	117.5	96.8	78.5	103.7	110.1	97.1	102.6	89.7
1942											
January	96.0	100.8	93.7	114.9	93.6	78.2	103.5	109.3	96.0	102.4	89.3
February	96.7	101.3	94.6	115.3	95.2	78.0	103.6	110.1	97.0	102.5	89.3
March	97.6	102.8	96.1	116.7	96.6	77.7	103.8	110.5	97.1	102.6	89.7
April	98.8	104.5	98.7	119.2	97.7	77.7	103.8	110.2	97.1	102.8	90.3
May	98.8	104.4	98.9	118.8	98.0	78.0	103.9	110.1	97.3	102.9	90.5
June	98.6	104.4	99.3	118.2	97.6	78.4	103.9	110.1	97.2	102.9	90.2
July	98.7	105.3	99.2	118.2	97.1	79.0	103.8	110.3	96.7	102.8	89.8
August	99.2	106.1	100.8	118.2	97.3	79.0	103.8	110.3	96.2	102.7	88.9
September	99.6	107.8	102.4	118.1	97.1	79.0	103.8	110.4	96.2	102.5	88.8
October	100.0	109.0	103.4	117.8	97.1	79.0	103.8	110.4	96.2	102.5	88.6
November	100.3	110.5	103.5	117.8	97.1	79.1	103.8	110.1	99.5	102.5	90.1
December	101.0	113.8	104.3	117.8	97.2	79.2	103.8	110.0	99.5	102.5	90.5

Source—Bureau of Labor Statistics

Indexes of Earnings, Cost of Living, and Real Wages

Source—National Industrial Conference Board

TREND OF WAGE EARNINGS IN 25 MANUFACTURING INDUSTRIES



Indexes of Earnings, Cost of Living and Real Wages

In 25 Manufacturing Industries

Index Numbers, 1923 = 100

	Actual Earnings		Cost of Living	Real Wages	
	Hourly	Weekly		Hourly	Weekly
1929	109.1	107.3	100.1	108.9	107.1
1930	108.9	97.1	96.7	112.6	100.4
1931	104.3	85.0	87.2	119.6	97.5
1932	92.1	64.1	77.9	118.2	82.3
1933	90.8	66.6	74.9	121.2	88.9
1934	107.2	75.4	79.4	135.0	95.0
1935	110.7	83.5	82.2	132.5	101.6
1936	114.4	91.7	84.1	136.0	109.0
1937	128.5	100.7	87.8	146.3	114.6
1938	132.3	91.8	85.7	154.3	107.1
1939	133.1	101.6	84.5	157.5	120.2
1940	136.6	107.3	85.3	160.1	125.7
1941	150.5	126.3	89.0	169.1	141.9
1942	170.8	150.4	97.7	174.8	153.9
1941					
January	140.3	115.0	86.0	163.1	133.7
February	141.2	118.0	86.1	164.0	137.0
March	142.1	119.5	86.3	164.7	138.5
April	144.9	119.8	86.9	166.7	137.9
May	147.7	124.5	87.4	169.0	142.4
June	151.2	128.7	88.5	170.8	145.4
July	151.9	126.6	88.9	170.9	142.4
August	153.0	128.1	89.4	171.1	143.3
September	156.2	131.9	90.8	172.0	145.3
October	157.7	134.0	92.0	171.4	145.7
November	159.0	134.3	92.9	171.2	144.6
December	160.4	135.6	93.2	172.1	145.5
1942					
January	162.3	140.8	94.5	171.7	149.0
February	162.7	141.0	95.1	171.1	148.3
March	164.1	143.3	96.1	170.8	149.1
April	165.6	145.4	97.1	170.5	149.7
May	167.5	146.6	97.3	172.1	150.7
June	169.5	148.5	97.3	174.2	152.6
July	171.5	149.6	97.8	175.4	153.0
August	173.8	153.6	98.1	177.2	156.6
September	176.9	157.0	98.6	179.4	159.2
October	177.1	158.2	99.7	177.6	158.7
November	178.6	159.7	100.3	178.1	159.2
December	179.3	161.6	101.0	177.5	160.0

Source—National Industrial Conference Board.

Cost of Living of Wage Earners in the United States

Source: National Industrial Conference Board

Index Numbers, 1923 = 100

	Weighted Average All Items	Food	Housing	Clothing	Fuel and Light	Sundries
1929	100.1	106.9	92.0	98.7	93.4	99.7
1930	96.7	101.7	89.5	92.0	92.7	98.7
1931	87.2	83.7	82.4	79.5	90.5	96.6
1932	77.9	69.7	72.4	66.5	86.9	93.6
1933	74.9	67.8	63.8	67.6	85.2	91.4
1934	79.4	75.3	64.8	77.5	86.9	93.2
1935	82.2	80.8	70.3	75.0	85.7	93.8
1936	84.1	81.6	77.9	73.8	86.0	94.6
1937	87.8	84.7	86.5	76.9	85.2	96.9
1938	85.7	78.7	87.0	74.3	85.2	97.3
1939	84.5	76.6	86.3	72.3	84.9	96.8
1940	85.3	77.7	86.9	73.1	85.4	97.5
1941	89.0	85.3	88.5	75.3	87.9	99.4
1942	97.7	100.9	90.8	87.3	90.4	104.5
1941						
January	86.0	78.7	87.6	73.0	86.4	98.2
February	86.1	78.8	87.7	73.1	86.4	98.2
March	86.3	79.2	87.7	73.2	86.4	98.3
April	86.9	81.0	87.8	73.3	86.4	98.3
May	87.4	82.2	88.0	73.6	86.4	98.5
June	88.5	85.5	88.2	73.6	86.7	98.6
July	88.9	86.2	88.4	73.8	87.8	98.7
August	89.4	87.3	88.6	74.5	88.6	98.8
September	90.8	89.4	88.9	76.9	89.4	99.8
October	92.0	90.7	89.2	78.3	90.0	101.5
November	92.9	92.2	89.5	79.6	90.2	101.9
December	93.2	92.6	89.9	80.1	90.3	102.2
1942						
January	94.5	95.2	90.1	82.4	90.3	102.5
February	95.1	95.7	90.4	84.5	90.4	102.9
March	96.1	97.5	90.7	85.8	90.4	103.5
April	97.1	98.8	91.0	88.4	90.1	104.1
May	97.3	99.1	91.1	88.6	90.5	104.2
June	97.3	99.5	91.0	88.1	90.4	104.1
July	97.8	100.3	90.8	88.0	90.4	105.0
August	98.1	101.1	90.8	88.2	90.4	105.0
September	98.6	102.8	90.8	88.4	90.5	104.7
October	99.7	105.4	90.8	88.5	90.5	105.4
November	100.3	106.5	90.8	88.6	90.5	106.2
December	101.0	108.3	90.8	88.6	90.6	106.4
1943						
January	101.4	109.1	90.8	88.6	91.7	106.6

GENERAL INDUSTRIAL

Wages and Hours

Average Actual Hourly Earnings in Manufacturing Industries, 1932—1942

Note: Hourly Earnings are not wage rates, because they include overtime and incentive payments.

INDUSTRY	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
Agricultural Implement	$.546	$.535	$.609	$.666	$.675	$.777	$.800	$.805	$.817	$.901	$1.003
Automobile	.609	.609	.715	.752	.791	.916	.953	.953	.971	1.083	1.242
Boot and Shoe	.405	.457	.552	.570	.567	.546	.542	.521	.535	.589	.668
Chemical	.485	.488	.580	.606	.623	.722	.748	.757	.787	.851	.944
Cotton—North	.333	.358	.442	.448	.452	.514	.500	.491	.511	.564	.671
Electrical Manufacturing	.594	.571	.648	.667	.669	.756	.801	.796	.813	.900	1.009
Furniture	.448	.405	.518	.537	.550	.619	.653	.661	.681	.756	.846
Hosiery and Knit Goods	.397	.391	.525	.520	.511	.556	.573	.546	.557	.578	.643
Iron and Steel	.531	.524	.628	.655	.670	.818	.830	.841	.850	.958	1.041
Leather Tanning and Finishing	.459	.449	.548	.555	.563	.621	.635	.643	.658	.708	.803
Lumber and Millwork	.412	.420	.486	.495	.599	.660	.692	.673	.690	.797	.927
Meat Packing	.431	.432	.531	.570	.566	.672	.695	.696	.693	.748	.817
Paint and Varnish	.517	.495	.559	.575	.615	.689	.707	.719	.731	.789	.888
Paper and Pulp	.468	.442	.514	.533	.545	.620	.645	.641	.668	.725	.817
Paper Products	.464	.449	.511	.523	.526	.568	.603	.611	.628	.666	.752
Printing—Book and Job	.710	.678	.717	.736	.724	.749	.790	.823	.826	.846	.884
Printing—News and Magazines	.786	.746	.836	.862	.875	.912	.950	.966	.978	.987	1.018
Rubber	.599	.600	.750	.801	.756	.847	.841	.863	.876	.927	1.010
Silk and Rayon	.385	.399	.508	.527	.507	.516	.526	.518	.529	.554	.639
Wool	.385	.400	.515	.516	.531	.608	.608	.595	.623	.688	.794
Foundries and Machine Shops	.524	.501	.574	.594	.611	.699	.728	.738	.761	.850	.999

Source—National Industrial Conference Board.

Average Actual Weekly Earnings in Manufacturing Industries, 1932—1942

INDUSTRY	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
Agricultural Implement	$17.96	$18.93	$23.42	$26.42	$26.78	$31.08	$28.08	$30.56	$32.12	$37.33	$43.42
Automobile	18.50	21.84	23.69	28.04	29.81	32.31	30.77	33.26	36.22	42.45	55.22
Boot and Shoe	16.67	17.94	20.58	21.15	20.89	20.89	17.76	18.74	18.12	22.21	25.88
Chemical	19.68	19.04	22.33	23.79	24.86	28.74	27.97	29.71	31.36	34.96	39.45
Cotton—North	14.10	14.63	15.62	16.31	17.34	19.44	17.89	18.56	19.14	22.47	28.21
Electrical Manufacturing	17.43	18.92	21.94	24.14	26.22	29.32	27.06	30.36	32.95	39.35	46.46
Furniture	15.04	14.42	18.06	20.32	22.96	24.95	23.00	25.37	26.69	31.88	36.65
Hosiery and Knit Goods	15.26	15.22	18.14	17.96	18.28	20.30	19.46	19.98	19.75	21.41	24.52
Iron and Steel	14.51	17.81	18.38	22.42	26.65	29.92	22.91	29.09	30.69	36.96	40.60
Leather Tanning and Finishing	18.74	18.67	20.09	21.11	22.01	23.67	22.57	24.84	24.61	28.66	33.24
Lumber and Millwork	14.97	14.79	16.98	19.48	24.39	25.90	25.36	26.68	27.38	32.48	40.25
Meat Packing	20.77	19.20	21.75	23.14	23.71	26.75	28.13	27.84	27.77	29.25	32.61
Paint and Varnish	21.43	19.89	21.68	22.90	27.86	28.32	27.61	29.24	29.45	32.79	38.36
Paper and Pulp	18.98	18.15	19.27	21.07	23.20	26.06	24.83	26.10	27.52	31.26	35.21
Paper Products	19.03	18.23	18.59	20.00	21.56	23.26	23.08	24.42	24.74	27.61	31.04
Printing—Book and Job	27.31	25.71	26.62	28.28	28.81	30.27	30.09	32.28	33.33	34.79	35.83
Printing—News and Magazines	33.17	29.24	30.46	31.18	32.56	34.55	34.71	35.72	36.43	37.51	39.60
Rubber	19.87	19.67	24.23	26.52	27.64	28.16	25.52	30.65	31.01	35.65	41.40
Silk and Rayon	14.94	14.79	15.88	16.89	17.33	18.22	16.96	18.23	18.24	20.80	25.86
Wool	15.09	15.65	16.96	18.91	19.19	21.03	19.62	21.31	22.34	27.44	32.42
Foundries and Machine Shops	15.77	16.61	20.15	22.46	25.30	28.85	24.98	28.55	31.56	38.93	47.50

Source—National Industrial Conference Board.

Average Actual Hours Per Week Per Wage Earner, 1929, 1933—1942

INDUSTRY	1929	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
Agricultural Implement	49.6	35.4	38.5	39.7	39.7	40.0	35.1	38.0	39.3	41.5	43.3
Automobile	46.8	36.0	33.2	37.4	37.7	35.3	32.3	34.9	37.3	39.2	44.4
Boot and Shoe	44.2	39.6	37.3	37.1	36.8	38.3	32.8	36.0	33.9	37.7	38.7
Chemical	50.4	39.1	38.5	39.3	39.9	39.8	37.4	39.3	39.9	41.1	41.8
Cotton—North	48.2	41.8	35.4	36.4	38.4	37.9	35.7	37.8	37.5	39.8	42.0
Electrical Manufacturing	47.4	33.2	33.9	36.2	39.2	38.8	33.8	38.2	40.5	43.7	46.0
Furniture	46.9	35.7	34.8	37.8	41.8	40.4	35.3	38.4	39.2	42.2	43.3
Hosiery and Knit Goods	47.6	39.2	34.6	34.5	35.8	36.6	34.0	36.6	35.4	37.1	38.1
Iron and Steel	54.9	34.0	29.3	34.2	39.8	36.6	27.6	34.6	36.1	38.6	39.0
Leather Tanning and Finishing	47.6	41.8	36.6	38.1	39.1	38.2	35.6	38.6	37.4	40.5	41.4
Lumber and Millwork	45.4	35.4	35.0	39.3	40.7	39.3	36.6	39.6	39.7	40.7	43.3
Meat Packing	50.6	44.8	40.9	40.6	41.9	39.8	40.5	40.1	40.1	39.1	39.9
Paint and Varnish	51.8	40.3	38.8	39.9	45.3	41.2	39.0	40.7	40.3	41.5	41.9
Paper and Pulp	52.1	41.1	37.5	39.6	42.6	42.1	38.5	40.7	41.2	43.1	43.1
Paper Products	49.5	40.5	36.4	38.2	41.0	41.0	38.3	40.0	39.4	41.4	41.2
Printing—Book and Job	46.0	37.9	37.2	38.4	39.8	40.4	38.1	39.2	40.3	41.1	41.6
Printing—News and Magazines	45.7	39.3	36.5	36.2	37.2	37.9	36.6	37.0	37.3	38.0	38.8
Rubber	44.8	32.7	32.3	33.1	36.6	33.3	30.3	35.5	35.4	38.5	40.9
Silk and Rayon	47.8	37.5	31.2	32.1	34.2	35.3	32.3	35.2	34.4	37.6	40.4
Wool	46.4	39.5	33.0	36.7	36.1	34.7	32.4	35.8	35.9	39.9	40.8
Foundries and Machine Shops	49.4	33.1	35.1	37.8	41.4	41.4	34.3	38.6	41.4	45.8	47.5

ource—National Industrial Conference Board.

Registrations

Total U. S. Motor Vehicle Registrations by Years

Showing Increases and Decreases

	Passenger Cars	Trucks and Buses	Total Motor Vehicles	Per Cent Increase
1895	4	....	4	....
1896	16	....	16	....
1897	90	....	90	....
1898	800	....	800	....
1899	3,200	....	3,200	....
1900	8,000	....	8,000	....
1901	14,800	....	14,800	....
1902	23,000	....	23,000	....
1903	32,920	....	32,920	....
1904	54,590	410	55,000	....
1905	77,400	600	78,000	42
1906	105,900	1,100	107,000	37
1907	140,300	1,700	142,000	33
1908	194,400	3,100	197,500	39
1909	305,950	6,050	312,000	58
1910	458,500	10,000	468,500	50
1911	619,500	20,000	639,500	36
1912	902,600	41,400	944,000	48
1913	1,194,262	63,800	1,258,062	33
1914	1,625,739	85,600	1,711,339	36
1915	2,309,666	136,000	2,445,666	43
1916	3,297,996	215,000	3,512,996	44
1917	4,657,340	326,000	4,983,340	42
1918	5,621,617	525,000	6,146,617	23
1919	6,771,074	794,372	7,565,446	23
1920	8,225,859	1,006,082	9,231,941	22
1921	9,346,195	1,118,520	10,464,715	13
1922	10,864,128	1,375,725	12,239,853	17
1923	13,479,608	1,612,569	15,092,177	23
1924	15,460,649	2,134,724	17,595,373	17
1925	17,496,420	2,440,854	19,937,274	13
1926	19,237,171	2,764,222	22,001,393	10
1927	20,219,224	2,914,019	23,133,243	5
1928	21,379,125	3,113,999	24,493,124	6
1929	23,121,589	3,379,854	26,501,443	8
1930	23,183,241	3,473,831	26,657,072	0.2
1931*	22,567,381	3,426,515	25,993,896	−2.5
1932*	21,139,092	3,202,730	24,341,822	−6.4
1933	20,557,493	3,292,439	23,849,932	−2.0
1934*	21,535,199	3,346,268	24,881,467	4.3
1935*	22,630,715	3,595,042	26,225,757	5.2
1936*	24,161,820	3,929,889	28,091,709	7.2
1937*	25,476,786	4,172,484	29,649,270	5.6
1938*	25,031,225	4,127,390	29,158,615	−1.7
1939*	25,854,022	4,440,206	30,294,228	+4.0
1940*	26,918,183	4,648,141	31,566,324	+4.1
1941*	28,842,622	4,878,315	33,720,937	+6.9
1942*	27,392,528	4,618,235	32,010,763	−5.1

* AUTOMOTIVE *and* AVIATION INDUSTRIES count, all others Bureau of Public Roads.

Distribution of the Country's Automobiles by States

(End-of-the-Year Figures 1942-1941)

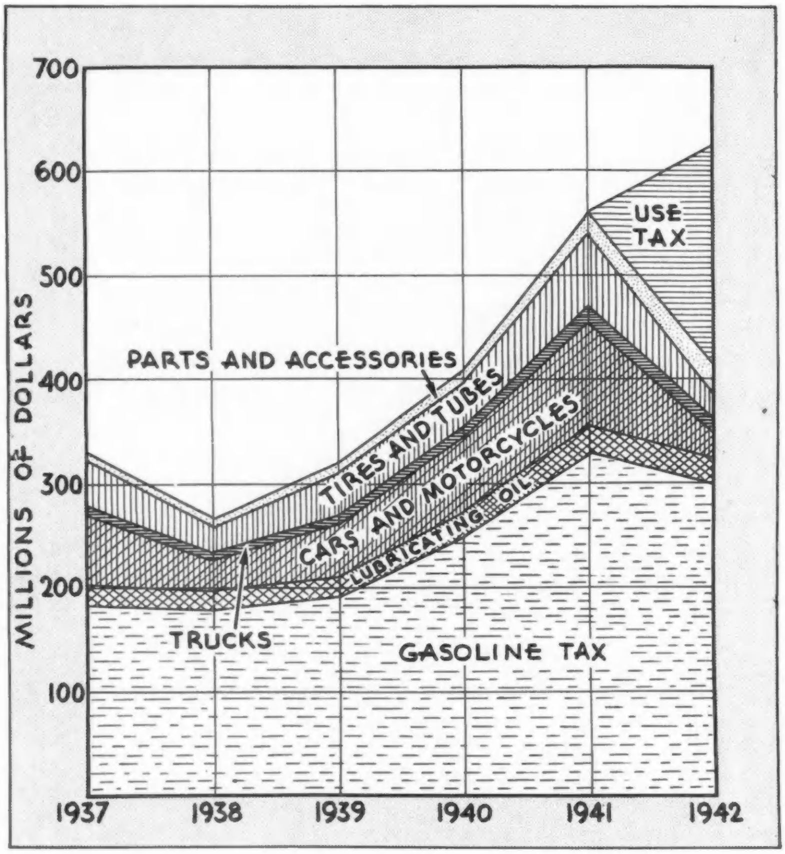
	Passenger Cars 1942	Passenger Cars 1941	Trucks 1942	Trucks 1941	Buses 1942	Buses 1941	Total Motor Vehicles 1942	Total Motor Vehicles 1941	Per Cent Change	Per Cent of Total 1942	Per Cent of Total 1941
Alabama (1)	300,259	291,379	65,498	65,909	1,351	771	367,108	358,059	+2.5	1.15	1.06
Arizona	115,130	117,377	26,000	26,689	350	335	141,480	144,401	−2.1	.44	.43
Arkansas	213,081	212,522	75,267	77,191	(5)	536	288,348	290,249	−0.7	.90	.86
California (3)	2,378,731	2,518,697	344,516	350,261	(4)	(4)	2,723,247	2,868,958	−5.1	8.51	8.51
Colorado	316,000	336,702	30,000	31,044	(5)	(5)	346,000	367,746	−5.9	1.08	1.09
Connecticut	467,078	470,566	55,378	79,256	1,294	1,279	523,750	551,101	−5.0	1.64	1.63
Delaware	55,765	83,050	13,416	13,969	(4)	(4)	69,181	97,019	−28.7	.22	.29
District of Columbia	143,810	158,616	14,646	13,809	2,319	1,651	160,775	174,076	−7.7	.50	.52
Florida	422,800	466,199	86,000	87,706	2,635	1,529	511,435	555,434	−8.0	1.60	1.65
Georgia	444,732	457,782	96,655	99,506	3,883	3,903	545,270	561,191	−2.9	1.70	1.66
Idaho	122,400	134,377	34,500	36,515	224	139	157,124	171,031	−8.2	.49	.51
Illinois	1,748,253	1,825,142	233,386	234,703	(4)	(4)	1,981,639	2,059,845	−3.8	6.19	6.11
Indiana	923,000	929,115	134,000	135,834	2,944	1,570	1,059,944	1,066,519	−0.7	3.31	3.16
Iowa	655,000	712,584	102,000	108,985	(4)	(4)	757,000	821,569	−7.9	2.36	2.44
Kansas	505,754	503,921	119,725	113,872	.....	660	625,479	618,453	+1.1	1.95	1.83
Kentucky	384,294	414,845	77,412	81,663	1,177	919	462,883	497,427	−7.0	1.45	1.48
Louisiana	335,576	347,593	73,638	93,305	884	(2) 3,022	410,098	443,920	−7.7	1.28	1.32
Maine	153,000	176,321	43,000	45,748	435	298	196,435	222,367	−11.7	.61	.66
Maryland (1)	430,679	429,016	60,627	60,876	1,530	1,379	492,836	491,271	+0.3	1.54	1.46
Massachusetts	799,077	845,874	109,783	110,650	5,489	5,115	914,349	961,639	−5.0	2.86	2.85
Michigan	1,196,154	1,144,551	131,597	129,589	(4)	(4)	1,327,751	1,274,140	+ 4.2	4.15	3.78
Minnesota	721,518	772,932	123,213	129,710	345	282	845,076	902,924	−6.5	2.64	2.68
Mississippi	200,000	202,624	63,500	64,119	500	490	264,000	267,233	−1.3	.82	.79
Missouri	794,846	820,080	159,342	164,546	(4)	(4)	954,188	984,626	−3.1	2.98	2.92
Montana	128,636	147,256	46,695	51,476	(4)	(4)	175,331	198,732	−11.8	.55	.59
Nebraska	346,515	354,903	70,328	71,283	287	382	417,130	426,568	−2.3	1.30	1.26
Nevada	40,225	38,480	10,037	9,524	144	156	50,406	48,160	+4.6	.16	.14
New Hampshire	96,716	109,971	32,569	32,118	(4)	315	129,285	142,404	−9.3	.40	.42
New Jersey	942,500	1,019,155	136,000	141,329	6,000	5,432	1,084,500	1,165,916	−7.0	3.39	3.46
New Mexico	86,000	98,251	28,000	30,806	800	814	114,800	129,871	−11.7	.36	.39
New York	2,213,700	2,506,472	306,100	348,819	7,575	5,621	2,527,375	2,860,912	−11.7	7.90	8.48
North Carolina	531,284	558,499	95,822	96,320	1,861	1,340	628,967	656,159	−4.2	1.96	1.95
North Dakota	142,148	152,020	41,935	40,788	103	111	184,186	192,919	−4.6	.58	.57
Ohio	1,875,000	1,800,000	160,000	192,000	(4)	(4)	2,035,000	1,992,000	+2.1	6.36	5.91
Oklahoma	440,911	478,348	109,586	107,903	1,756	492	552,253	586,743	−5.9	1.73	1.74
Oregon	341,367	353,213	75,217	75,538	982	689	417,566	429,440	−2.8	1.30	1.27
Pennsylvania	1,879,439	1,999,868	274,745	274,967	7,554	6,472	2,161,738	2,281,307	−5.3	6.75	6.76
Rhode Island	168,954	174,045	21,876	21,174	619	485	191,449	195,704	−2.2	.60	.58
South Carolina (6)	295,211	313,731	48,341	50,638	1,748	(5)	345,300	364,369	−5.3	1.08	1.08
South Dakota	163,000	167,590	33,000	34,952	145	141	196,145	202,683	−3.2	.61	.60
Tennessee	378,500	424,961	72,000	81,022	(5)	(5)	450,500	505,983	−11.0	1.41	1.50
Texas	1,316,479	1,440,996	297,526	368,863	1,504	1,002	1,615,509	1,810,861	−11.8	5.05	5.37
Utah	128,440	125,796	24,905	24,208	609	537	153,954	150,541	+2.2	48	.45
Vermont	77,748	87,048	9,858	10,327	139	111	87,745	97,486	−10.0	27	.29
Virginia	455,000	468,667	83,000	83,594	1,500	1,119	539,500	553,380	−2.5	1.69	1.64
Washington	517,000	520,599	92,000	94,772	750	1,659	609,750	617,030	−1.2	1.90	1.83
West Virginia	245,669	251,577	49,321	49,541	1,016	665	296,006	301,783	−2.0	.92	.89
Wisconsin	688,437	807,810	144,684	158,087	947	916	834,068	966,813	−13.8	2.61	2.87
Wyoming	66,712	71,501	20,192	20,474	(5)	(5)	86,904	91,975	−5.6	.27	.27
Total	27,392,528	28,842,622	4,556,836	4,825,978	61,399	52,337	32,010,763	33,720,937	−5.1	100.00	100.00

(1)—For fiscal year ending September 30.
(2)—Includes taxicabs.
(3)—[illegible] light commercial vehicles registered as passenger cars have been transferred to trucks for 1941; approximately 131,000 for 1942.
(4)—Included with trucks.
(5)—Included with passenger cars.
(6)—From November 1 to October 31.

Federal and State

Sources of Revenue from Federal Automotive Taxes

Note that use tax greatly exceeds loss in other taxes due to curtailed driving and no production.



Federal Automotive Taxes, 1932-1942

Year	Dollar Volume
1932	$75,006,210
1933	229,631,826
1934	235,140,802
1935	256,097,573
1936	295,919,324
1937	323,478,737
1938	266,867,164
1939	319,806,967
1940	410,568,171
1941	561,882,091
1942	625,430,886

Tax on Use of Motor Vehicles

1942	Revenue Collected	Value per Stamp
January	$17,351,612	$2.09
February	39,371,107	....
March	4,608,245	....
April	762,165	....
May	379,116	....
June	10,152,626	5.00
July	119,502,401	5.00
August	13,262,733	4.59
September	2,283,172	4.17
October	936,877	3,75
November	851,066	3.34
December	697,343	2.92
Total	$210,158,463	....

Federal Automotive Taxes—by Category

Source of Revenue	1942	1941	1940	1939	1938
Gasoline *	$299,649,334	$330,310,845	$250,671,847	$191,543,419	$178,783,909
Lubricating Oils *	23,882,339	25,434,079	22,097,673	19,930,773	19,608,503
Automobiles and Motorcycles	26,933,595	101,463,603	71,275,162	51,063,559	29,405,044
Trucks	13,329,538	14,253,274	9,285,246	7,144,898	5,230,378
Tires and Tubes (Incl. Floor Tax)	25,356,783	71,858,420	45,091,092	41,167,734	26,771,719
Parts and Accessories	26,120,834	18,561,870	12,147,151	8,956,584	7,067,611
Use of Motor Vehicles	210,158,463	....	....	....	....
Total	$625,430,886	$561,882,091	$410,568,171	$319,806,967	$266,867,164

State Automotive Taxes *(Exclusive of State or Local Sales Tax)*

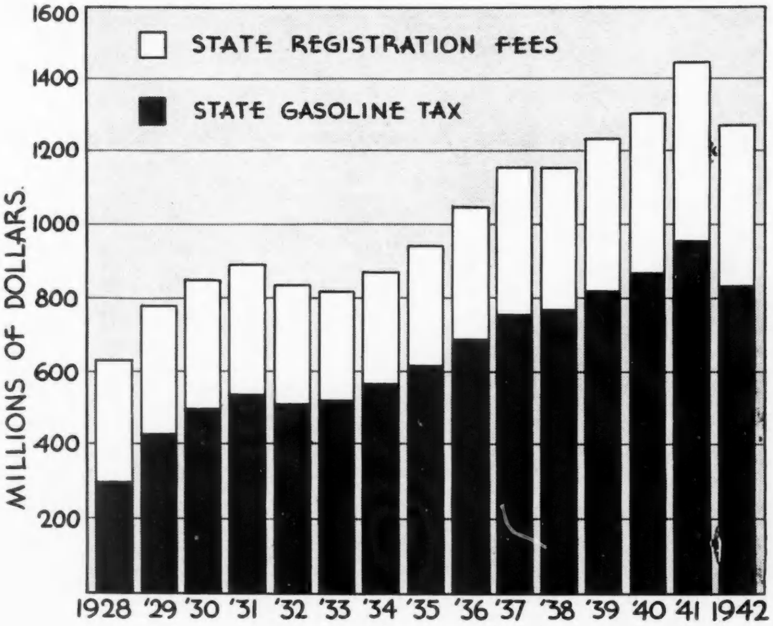
	1942	1941	1940	1939	1938
Gasoline	$831,381,000	$950,956,000	$864,472,000	$816,433,000	$766,853,000
Registration Fees	442,364,000	490,666,000	438,010,000	412,494,000	388,825,000
Total—State Taxes	$1,273,745,000	$1,440,622,000	$1,302,482,000	$1,228,927,000	$1,155,678,000
Grand Total—Federal and State Taxes	$1,899,175,886	$2,002,504,091	$1,713,050,171	$1,548,733,967	$1,422,545,164
U. S. Average Tax per Motor Vehicle	$59.32	$59.38	$54.26	$51.12	$48.78

*—Automotive share only based on 89% of total gasoline revenue and 58% lubricating oil revenue.

Automotive Taxes

State Automotive Taxes—1928-1942

Year	Gasoline Tax	Registration Fees
1928	$304,872,000	$322,630,000
1929	431,312,000	347,844,000
1930	493,865,000	355,705,000
1931	536,397,000	344,338,000
1932	513,047,000	324,274,000
1933	518,196,000	302,716,000
1934	565,027,000	307,260,000
1935	616,852,000	322,954,000
1936	686,631,000	359,783,000
1937	756,930,000	399,613,000
1938	766,853,000	388,825,000
1939	816,433,000	412,494,000
1940	864,472,000	439,178,000
1941	950,956,000	490,666,000
1942	831,381,000	442,364,000



1942 Automotive State Tax Revenue Drops 12% from 1941

State Gasoline Tax Receipts and Registration Fees — 1942-1941

(Exclusive of State or Local Sales Tax)

STATE	State Tax—Cents per Gallon	State Gasoline Tax Receipts 1942	State Gasoline Tax Receipts 1941	Per Cent Change	State Registration Fees 1942	State Registration Fees 1941	Per Cent Change	Total State Tax Receipts from Gasoline and Registration Fees 1942	Total State Tax Receipts from Gasoline and Registration Fees 1941	State Taxes per Motor Vehicle 1942	State Taxes per Motor Vehicle 1941
Alabama	6	$18,335,000	$18,323,000	......	$6,400,000	$6,431,000	— 0.5	$24,735,000	$24,754,000	$67.37	$69.13
Arizona	5	5,100,000	5,361,000	— 4.9	1,300,000	1,352,000	— 3.9	6,400,000	6,713,000	45.23	46.48
Arkansas	6½	12,659,000	13,100,000	— 3.4	3,896,000	3,935,000	— 1.0	16,555,000	17,035,000	57.41	58.69
California	3	52,250,000	58,076,000	—10.0	30,000,000	31,927,000	— 6.0	82,250,000	90,003,000	30.20	31.37
Colorado	4	7,500,000	8,833,000	—15.1	2,594,000	2,953,000	—12.2	10,094,000	11,786,000	29.17	32.04
Connecticut	3	9,020,000	11,758,000	—23.3	7,837,000	8,249,000	— 5.0	16,857,000	20,007,000	31.07	36.30
Delaware	4	2,027,000	2,501,000	—19.0	1,194,000	1,456,000	—18.0	3,221,000	3,957,000	46.55	40.78
District of Columbia	3	1,814,000	3,479,000	—47.9	1,345,000	1,985,000	—32.3	3,159,000	5,464,000	50.89	31.38
Florida	7	23,390,000	29,832,000	—21.6	10,060,000	9,463,000	+ 6.3	33,450,000	39,295,000	65.40	70.74
Georgia	6	21,856,000	26,049,000	—16.1	2,228,000	2,951,000	—24.5	24,084,000	29,000,000	44.16	51.67
Idaho	5.1	4,500,000	5,231,000	—14.0	1,321,000	1,542,000	—14.3	5,821,000	6,773,000	37.04	39.60
Illinois	3	39,734,000	44,762,000	—11.2	26,475,000	26,567,000	— 0.4	66,209,000	71,329,000	33.41	34.62
Indiana	4	27,081,000	28,518,000	— 5.0	10,611,000	11,628,000	— 8.8	37,692,000	40,146,000	35.56	37.64
Iowa	3	13,900,000	15,338,000	— 9.4	13,702,000	14,231,000	— 3.8	27,602,000	29,569,000	36.46	36.00
Kansas	3	9,818,000	11,234,000	—12.6	4,445,000	4,743,000	— 6.3	14,263,000	15,977,000	22.80	25.83
Kentucky	5	14,239,000	16,175,000	—12.0	4,635,000	6,076,000	—23.8	18,874,000	22,251,000	40.77	44.73
Louisiana	7	19,525,000	21,425,000	— 8.9	3,343,000	3,486,000	— 4.2	22,868,000	24,911,000	55.76	56.11
Maine	4	5,286,000	6,657,000	—20.6	3,885,000	4,434,000	—12.4	9,171,000	11,091,000	46.68	49.87
Maryland	4	11,313,000	13,070,000	—13.5	6,193,000	7,830,000	—20.9	17,506,000	20,900,000	35.52	42.54
Massachusetts	3	16,627,000	22,488,000	—26.1	7,340,000	7,905,000	— 7.2	23,967,000	30,393,000	26.21	31.60
Michigan	3	31,506,000	35,585,000	—11.5	24,640,000	27,163,000	— 9.3	56,146,000	62,748,000	42.28	49.24
Minnesota	4	18,861,000	18,870,000	......	9,998,000	19,530,000	*	28,859,000	38,400,000	34.14	42.52
Mississippi	6	12,500,000	13,753,000	— 9.1	3,300,000	3,433,000	— 3.9	15,800,000	17,186,000	59.84	64.31
Missouri	2	12,877,000	14,277,000	— 9.8	10,918,000	11,713,000	— 6.8	23,795,000	25,990,000	24.93	26.39
Montana	5	4,705,000	5,467,000	—13.9	1,500,000	1,797,000	—16.5	6,205,000	7,264,000	35.39	36.55
Nebraska	5	11,763,000	12,268,000	— 4.1	2,713,000	3,195,000	—15.1	14,476,000	15,463,000	34.70	36.24
Nevada	4	1,506,000	1,683,000	—10.5	388,000	405,000	— 4.2	1,894,000	2,088,000	37.57	43.35
New Hampshire	4	2,661,000	3,715,000	—28.4	2,943,000	3,291,000	—10.6	5,604,000	7,006,000	43.34	49.19
New Jersey	3	20,000,000	26,221,000	—23.7	21,700,000	24,349,000	—10.9	41,700,000	50,570,000	38.45	43.37
New Mexico	5	4,320,000	5,076,000	—14.9	2,000,000	2,213,000	— 9.6	6,320,000	7,289,000	55.05	56.12
New York	4	58,657,000	74,458,000	—21.2	50,000,000	53,978,000	— 7.4	108,657,000	128,436,000	43.00	44.89
North Carolina	6	24,264,000	30,649,000	—20.8	9,759,000	9,777,000	— 0.2	34,023,000	40,426,000	54.09	61.61
North Dakota	4	3,100,000	3,515,000	—11.8	1,917,000	2,025,000	— 5.4	5,017,000	5,540,000	27.23	28.71
Ohio	4	53,510,000	58,113,000	— 8.0	29,225,000	33,421,000	—12.6	82,735,000	91,534,000	40.65	45.95
Oklahoma	5½	19,477,000	18,661,000	+ 4.3	9,220,000	7,086,000	+30.1	28,697,000	25,747,000	51.96	43.88
Oregon	5	11,448,000	13,029,000	—12.2	3,706,000	4,416,000	—16.1	15,154,000	17,445,000	36.29	40.62
Pennsylvania	4	55,879,000	64,867,000	—13.9	37,248,000	41,326,000	— 9.9	93,127,000	106,193,000	43.07	46.54
Rhode Island	3	3,339,000	4,272,000	—21.8	3,266,000	3,425,000	— 4.7	6,605,000	7,697,000	34.50	39.32
South Carolina	6	15,413,000	15,817,000	— 2.6	2,260,000	2,749,000	—17.8	17,673,000	18,566,000	51.18	50.95
South Dakota	4	4,413,000	4,559,000	— 3.2	1,750,000	1,879,000	— 6.9	6,163,000	6,438,000	31.42	31.76
Tennessee	7	23,452,000	24,190,000	— 3.1	5,600,000	7,077,000	—20.9	29,052,000	31,267,000	64.48	61.79
Texas	4	46,903,000	52,747,000	—11.1	23,808,000	26,671,000	—10.8	70,711,000	79,418,000	43.77	43.85
Utah	4	4,226,000	4,432,000	— 4.7	1,267,000	1,335,000	— 5.1	5,493,000	5,767,000	35.67	38.30
Vermont	4	2,138,000	2,930,000	—27.0	2,480,000	2,750,000	— 9.9	4,618,000	5,680,000	52.62	58.26
Virginia	5	18,100,000	22,916,000	—21.0	8,225,000	8,363,000	— 1.7	26,325,000	31,279,000	48.79	56.52
Washington	5	17,402,000	19,321,000	—10.0	3,566,000	5,461,000	—34.7	20,968,000	24,782,000	34.38	40.16
West Virginia	5	9,300,000	11,553,000	—19.5	5,973,000	7,180,000	—16.8	15,273,000	18,733,000	51.59	62.07
Wisconsin	4	20,987,000	22,737,000	— 7.7	13,549,000	14,862,000	— 8.8	34,536,000	37,599,000	41.40	38.88
Wyoming	4	2,700,000	3,065,000	—12.0	641,000	652,000	— 1.7	3,341,000	3,717,000	38.44	40.41
Total		$831,381,000	$950,956,000	—12.6	$442,364,000	$490,666,000	— 9.8	$1,273,745,000	$1,441,622,000	$39.79†	$42.74†

†—U. S. Average per vehicle.

*—Not comparable due to a change in registration law during 1941.

Automobile R

Quotas and Number of Certificates Issued Authorizing Purchase of

	March		April		May		June		July		August
	Monthly Quotas	Purchase Certificates Issued	Monthly Quotas	Purchase Certificates Issued	Monthly Quotas	Purchase Certificates Issued	Monthly Quotas	Purchase Certificates Issued	Monthly Quotas	Purchase Certificates Issued	Monthly Quotas
Alabama	584	252	584	456	584	538	584	458	526	399	330
Arizona	100	40	100	74	100	122	100	161	62	132	166
Arkansas	204	135	204	148	204	222	204	193	128	244	191
California	3,296	747	3,296	1,173	3,296	2,024	3,296	1,929	2,060	2,185	0
Colorado	320	129	320	130	320	250	320	207	161	287	161
Connecticut	1,001	398	1,001	525	1,001	478	1,001	332	626	315	0
Delaware	108	38	108	87	108	57	108	58	68	44	0
District of Columbia	216	176	216	199	216	236	216	189	135	212	0
Florida	384	161	384	316	384	323	384	293	153	311	0
Georgia	456	394	456	605	456	634	456	358	411	449	452
Idaho	96	73	96	67	96	102	96	87	59	93	67
Illinois	2,532	874	2,532	1,470	2,532	2,098	2,532	1,708	1,581	1,869	0
Indiana	1,481	822	1,481	1,144	1,481	1,200	1,481	1,045	1,035	1,112	672
Iowa	616	239	616	386	616	666	616	656	385	595	463
Kansas	576	201	576	282	576	254	576	245	359	418	0
Kentucky	340	376	340	410	340	471	340	303	241	345	298
Louisiana	421	271	421	389	421	440	421	359	295	415	353
Maine	248	103	248	81	248	117	248	108	99	157	0
Maryland	818	326	818	560	818	647	818	445	573	500	231
Massachusetts	1,377	368	1,377	418	1,377	549	1,377	415	550	606	0
Michigan	4,006	1,426	4,006	3,894	4,006	5,316	4,006	2,625	3,690	2,972	2,750
Minnesota	684	276	684	731	684	943	684	631	474	590	544
Mississippi	204	178	204	171	204	270	204	290	128	223	220
Missouri	980	416	980	614	980	784	980	531	612	676	414
Montana	104	61	104	72	104	144	104	92	64	129	73
Nebraska	324	124	302	302	324	323	324	306	202	293	206
Nevada	40	55	40	41	40	80	40	78	58	76	61
New Hampshire	136	57	136	39	136	45	136	42	54	51	0
New Jersey	1,651	762	1,651	633	1,651	799†	1,651	560†	826	4 3	0
New Mexico	68	52	68	45	68	64	68	62	34	5	53
New York	3,064	1,268	3,064	1,974	3,064	1,918	3,064	1,464	1,532	1,530†	0
North Carolina	408	220	408	274	408	535	408	485†	204	483	309
North Dakota	96	37	96	89	96	95	96	83	60	88	48
Ohio	2,808	1,443	2,808	2,772	2,808	2,720	2,808	2,329	2,249	2,502	1,775
Oklahoma	508	173	508	234	508	300†	508	325	254	439	0
Oregon	332	162	332	184	332	387	332	450	207	451	399
Pennsylvania	3,718	1,385	3,718	1,532	3,718	1,933	3,718	1,783	1,390	1,943†	0
Rhode Island	228	129	228	86	228	97	228	89	87	116	0
South Carolina	280	193	280	321	280	338	280	243	196	203†	119
South Dakota	112	38	112	70	112	103	112	132	56	85	54
Tennessee	456	318	456	618	456	386	456	500	319	424†	405
Texas	1,484	901	1,484	1,403	1,484	1,990	1,484	1,547	1,038	1,532	1,340
Utah	180	128	180	120	180	143	180	187	126	204	170
Vermont	72	48	72	35	72	50	72	43	45	36	0
Virginia	844	309	844	455	844	532	844	417	477	486	0
Washington	768	220	768	333	768	469	768	520	384	740	311
West Virginia	323	139	323	327	323	327	323	214	226	238	221
Wisconsin	892	432	892	617	892	777	892	662	466	708	337
Wyoming	56	34	56	31	56	89	56	58	35	73	57
Territories and Possessions	......	8	......	14	......	26	......	25	......	13	....
Federal Government	......	461	......	846	......	1,093	......	419	......	744	....
To Convert to Busses	......	0	......	0	......	0	......	0	......	0	....
Total	40,000	17,576	40,000	27,797	40,000	34,504	40,000	26,741	25,000	29,234	13,250

*—Office of Price Administration.
This table excludes 28,748 new passenger automobiles sold on or before January 1, 1942, but delivered after that date.
†—Estimated.

The Nation's Stock Pile of New Passenger Cars—Dec. 31, 1942

Total Inventory, February 11, 1942	520,793
Cars sold on or before January 1, 1942 but delivered at later date	28,478
Rationed to civilians and state municipal governments to December 31, 1942	220,101
Released to Federal Government Agencies and armed forces	32,244
Released for Bus conversions	79
Total Releases	280,902
Total Stock Pile, December 31, 1942	239,891
Total Inventory as of December 31, 1942	
Government Pool	113,544
Available for current rationing	126,347
Total Stock Pile, December 31, 1942	239,891

of New Passenger Cars—By States and by Months—1942*

August	September		October		November		December		1942 Totals		
Purchase Certificates Issued	Monthly Quotas	Purchase Certificates Issued	Monthly Quotas	Purchase Certificates Issued	Monthly Quotas	Purchase Certificates Issued	Monthly Quotas	Purchase Certificates Issued	Monthly Quotas	Purchase Certificates Issued	
453	524	350	583	†290	560	189	464	101	5,323	3,486	Alabama
134	175	100	215	74	201	36	166	37	1,385	910	Arizona
315	310	202	350	158	340	107	302	121	2,437	1,845	Arkansas
2,471	2,523	1,859	2,594	1,446	2,599	†987	2,185	†816	25,145	15,637	California
379	311	211	372	161	400	†100	352	†124	3,037	1,978	Colorado
386	523	270	560	229	495	181	378	161	6,586	3,275	Connecticut
47	60	49	79	39	77	27	60	58	776	504	Delaware
215	225	92	230	84	200	86	150	58	1,804	1,547	District of Columbia
281	438	279	462	†213	430	†135	387	†184	3,406	2,496	Florida
540	782	481	791	373	762	†215	799	†204	5,821	4,253	Georgia
158	147	96	177	†84	173	46	155	31	1,162	837	Idaho
2,112	2,127	1,416	2,171	917	2,063	604	1,564	†558	19,634	13,626	Illinois
1,077	1,276	637	1,314	413	1,129	334	936	204	12,286	7,988	Indiana
623	654	415	773	259	704	178	594	164	6,037	4,181	Iowa
406	549	455	561	258	494	173	591	†167	4,858	2,859	Kansas
323	488	338	508	189	539	106	443	†91	3,877	2,952	Kentucky
374	506	266	533	248	510	186	450	149	4,331	3,097	Louisiana
136	151	98	165	77	146	65	130	60	1,683	1,002	Maine
559	588	398	690	366	650	317	563	175	6,567	4,293	Maryland
537	837	408	863	337	804	284	610	252	9,172	4,174	Massachusetts
2,463	3,802	1,384	3,629	884	3,035	708	1,601	556	34,531	22,228	Michigan
634	908	453	866	344	774	187	658	183	6,960	4,972	Minnesota
323	244	167	346	170	332	101	327	89	2,413	1,982	Mississippi
890	884	526	974	340	912	221	760	†200	8,476	5,198	Missouri
157	171	117	182	105	175	61	173	56	1,254	994	Montana
388	387	265	401	182	488	96	415	98	3,395	2,377	Nebraska
95	101	114	119	39	132	21	107	29	738	628	Nevada
61	121	53	110	48	101	37	82	16	1,012	449	New Hampshire
555	1,157	448	957	477	838	†300	630	†327	11,012	5,284	New Jersey
74	106	50	116	56	115	37	103	†35	799	550	New Mexico
†1,447	2,017	†855	1,957	†800	1,923	†550	1,561	†490	21,246	12,296	New York
593	516	505	573	422	698	357	700	267	4,632	4,141	North Carolina
94	110	78	119	76	115	52	112	33	948	725	North Dakota
2,614	2,490	1,469	2,883	1,106	2,557	759	2,057	610	25,243	18,324	Ohio
451	614	373	664	238	615	192	510	191	4,689	2,916	Oklahoma
485	532	387	597	260	557	†141	487	†142	4,107	3,049	Oregon
†1,774	1,968	†1,121	2,091	†909	1,794	†600	1,426	†547	23,541	13,527	Pennsylvania
101	168	86	166	80	152	51	125	48	1,610	883	Rhode Island
256	332	291	333	226	395	185	448	158	2,943	2,414	South Carolina
100	138	108	144	58	134	51	130	51	1,104	796	South Dakota
†541	586	390	597	†325	574	†177	528	127	4,833	3,806	Tennessee
1,834	2,090	1,564	2,123	1,063	2,184	677	1,924	†764	16,638	13,275	Texas
208	246	193	289	124	291	90	298	47	2,140	1,444	Utah
48	119	42	99	28	96	27	83	16	730	373	Vermont
639	611	506	659	382	709	260	661	203	6,493	4,189	Virginia
923	643	522	659	330	718	258	640	†216	6,427	4,531	Washington
239	317	167	338	117	310	85	263	52	2,967	1,905	West Virginia
733	812	468	911	326	876	233	708	246	7,678	5,202	Wisconsin
117	96	78	104	54	124	38	104	22	744	594	Wyoming
13	....	5	....	3	....	0	....	2	....	109	Territories and Possessions
1,463	....	540	....	482	....	272	....	25,924	....	32,244	Federal Government
6	....	0	....	18	....	45	....	10	....	79	To Convert to Busses
31,845	35,500	21,745	37,000	16,287	35,000	11,225	28,900	35,470	334,650	252,424	Total

*—Office of Price Administration.
This table excludes 28,748 new passenger automobiles sold on or before January 1, 1942, but delivered after that date.
†—Estimated.

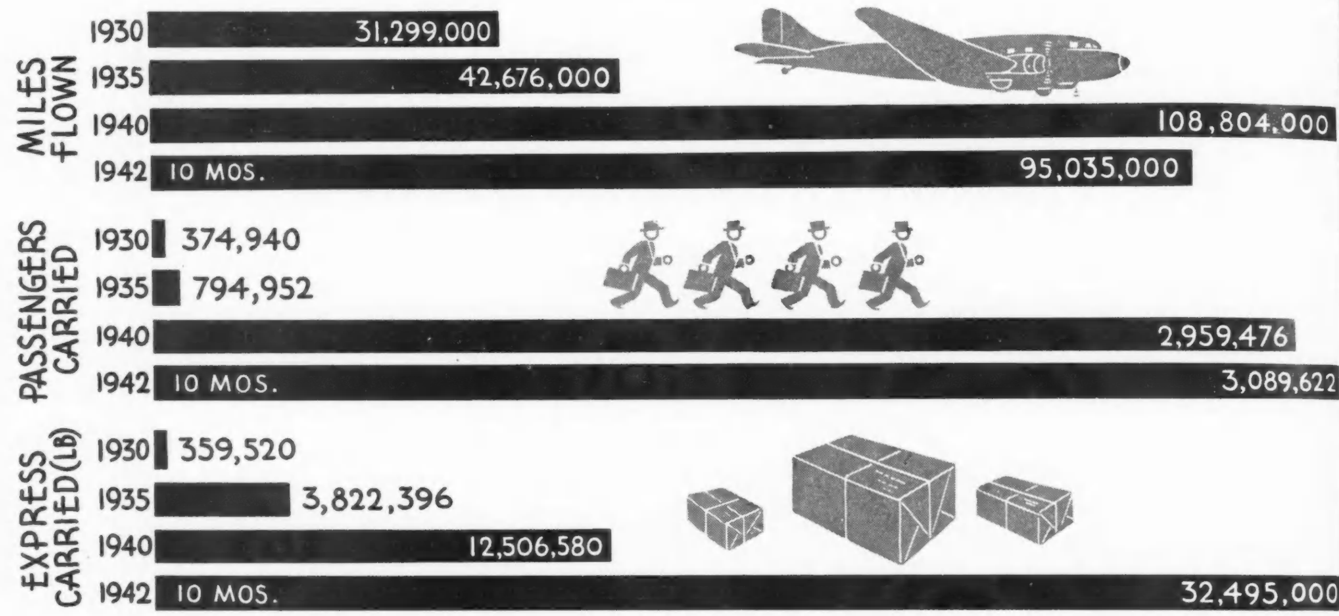
Comparative Record of Retail Sales of Passenger Cars

(New Registrations by Months, by Years)

	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	
January	126,776	87,493	79,821	61,242	136,635	215,775	280,685	145,765	203,212	260,216	297,558	January
February	134,133	82,813	69,464	94,887	170,615	176,651	215,049	120,359	164,942	224,625	299,701	February
March	200,841	92,192	78,741	173,287	261,477	301,239	363,738	181,222	248,038	312,371	419,396	March
April	265,732	121,093	119,909	223,050	319,650	397,186	384,951	192,241	268,335	353,239	488,460	April
May	247,727	131,282	160,242	219,225	293,199	392,744	391,697	178,052	280,834	345,748	514,478	May
June	201,911	148,752	174,190	223,846	280,360	369,422	360,236	156,384	243,741	318,615	443,470	June
July	194,322	104,188	185,660	229,006	285,178	357,490	365,767	148,896	229,308	315,246	391,795	July
August	155,744	93,457	178,661	193,198	233,851	262,912	306,958	127,954	182,633	211,031	246,595	August
September	124,903	81,893	157,976	146,931	157,098	208,896	235,683	93,269	141,633	148,000	125,293	September
October	102,659	63,195	136,326	140,937	148,389	171,397	202,898	119,053	212,586	290,495	165,485	October
November	75,829	44,358	94,180	107,574	220,262	223,732	196,463	200,853	231,571	301,430	164,747	November
December	77,564	45,683	58,624	75,356	237,194	327,053	179,621	226,973	246,544	344,073	174,188	December
Total	1,908,141	1,096,399	1,493,794	1,888,557	2,743,908	3,404,497	3,483,752	1,891,021	2,653,377	†3,415,905	3,731,166	Total

Miles Flown, Passengers and Express Carried On Scheduled Air Lines—By Years*

(Operating in Continental United States)



	Miles Flown (000 Omitted)	Passengers Carried	Passenger Miles Flown (000 Omitted)	Express Carried (Pounds)	Number of Planes in Service	Employees: Domestic Service	Employees: Domestic, Foreign and Territorial
1930	31,992	374,940	84,012	359,520	497	....	3,475
1931	42,756	469,980	106,440	788,064	490	....	5,667
1932	45,612	474,276	127,044	1,033,968	456	....	5,610
1933	48,768	493,140	173,496	1,510,212	408	....	6,295
1934	40,956	461,748	187,860	2,133,192	417	....	6,477
1935	†42,676	794,952	313,908	3,822,396	356	5,917	8,351
1936	63,780	1,020,936	435,744	6,957,768	272	7,045	9,995
1937	66,072	1,102,704	476,304	7,127,364	282	7,529	11,592
1938	69,672	1,343,424	557,724	7,335,972	253	8,955	13,309
1939	82,560	1,876,056	749,784	9,514,296	265	10,509	15,923
1940	108,804	2,959,476	1,147,420	12,506,580	358	15,800	22,056
1941	132,612	4,080,642	1,491,736	19,258,596	359	18,984	26,458
‡1942	102,812	3,330,327	1,369,475	36,469,000	....	....	....

* Civil Aeronautics Administration.
† Includes 1,719,919 miles flown by Army planes during period Feb. 20—May 31.
‡ Eleven Months Totals.

Number of Airports and Landing Fields in the United States

(As of January first of each year.)

	Municipal	Commercial	Intermediate	Auxiliary	Army	Navy	Miscellaneous	Total
1931	550	564	354	240	53	14	7	1,782
1932	636	673	404	300	54	13	13	2,093
1933	549	621	352	476	51	15	53	2,117
1934	563	652	265	550	55	18	85	2,188
1935	702	570	259	580	58	24	104	2,297
1936	739	494	291	630	63	26	125	2,368
1937	738	451	296	622	61	26	148	2,342
1938	764	414	283	602	61	26	149	2,299
1939	791	433	267	628	60	26	169	2,374
1940	643	456	266	665	59	21	170	2,280
1941	788	496	289	507	69	21	161	2,331
1942	1,086	930	283	30	77	38	40	2,484

*—Civil Aeronautics Administration.

Airplane and Engine Production

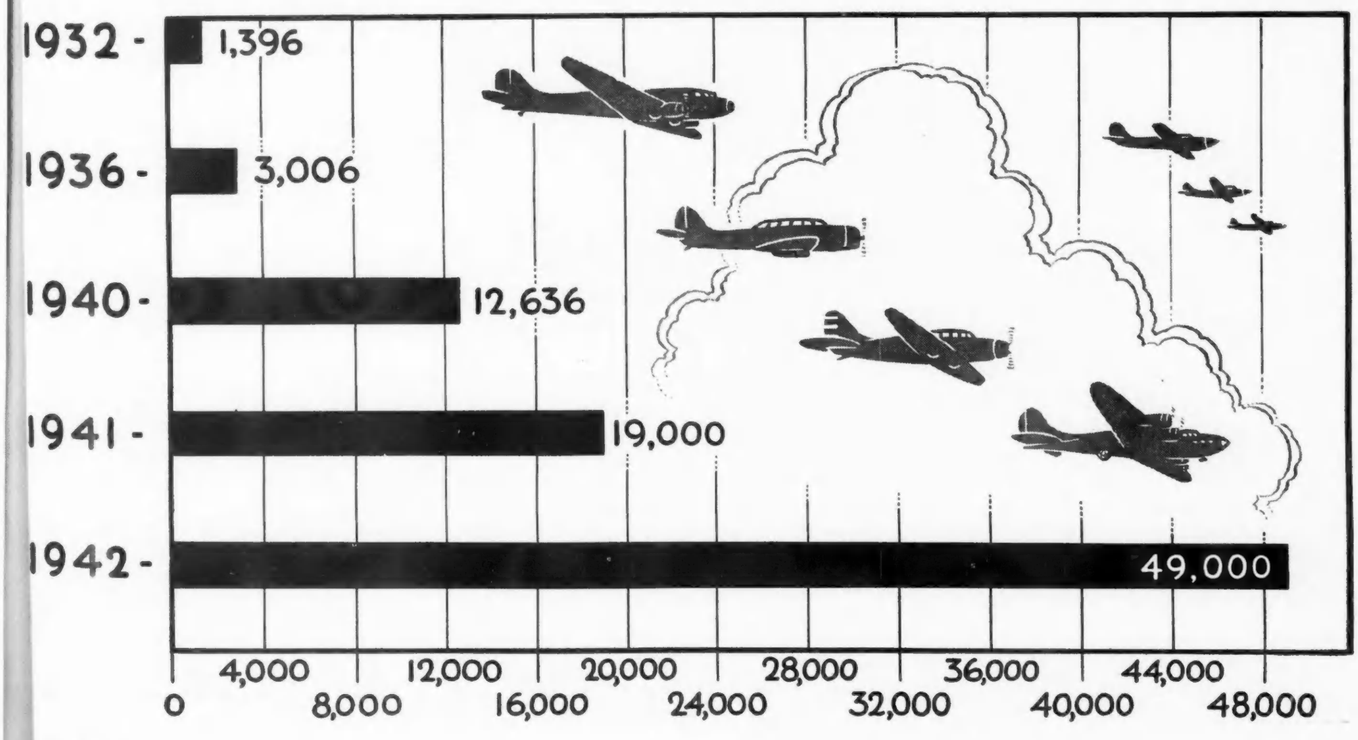
Note:—The number of airplanes produced and the value of their production pertain to only those airplanes on which production was started and completed for years 1931 to date. The values of the engines installed in the aircraft are not included in the values of the aircraft reported for 1931 and subsequent years. Data here presented do not show value of all work done by aircraft industry as it fails to take into consideration experimental work, work begun during a given year but not completed in that year, and all repair work.

	Number of Airplanes	Value of Airplanes	Value of Parts	Number of Engines	Value of Engines	Value of Parachutes, Pontoons and Propellers
1927	1,785	$7,187,460	$5,037,519	1,400	$9,493,696	$1,407,929
1928	4,346	43,411,000	(c)	3,496	19,916,000	1,336,000
1929	6,193	50,730,266	10,891,889	6,276	24,966,083	3,528,436
1930	3,437	27,333,736	7,211,992	4,356	17,267,795	3,904,394
1931	2,398	21,600,453	9,224,172	3,794	13,779,791	1,358,093
1932	1,396	15,287,789	4,231,495	1,959	8,902,808	1,497,516
1933	1,152	15,580,255	5,898,282	1,822	8,651,247	1,375,343
1934	1,615	25,399,000	(c)	2,545	15,825,000	2,668,000
1935	1,365	17,454,331	6,527,424	2,866	12,610,285	2,831,580
1936	3,006	47,531,565	(c)	4,295	26,383,055	4,234,273
1937	3,100	38,664,153	19,951,198	6,214	28,576,971	9,129,299
1938	2,698(a)	....	....	....	....	....
1939	3,770(a)	75,872,587(b)	36,687,925	10,355	....	14,513,948
1940	12,636	544,000,000(e)	(f)	....	(f)	(f)
1941	19,000(d)	1,750,000,000(e)	(f)	....	(f)	(f)
1942	49,000(d)	5,000,000,000(e)	(f)	....	(f)	(f)

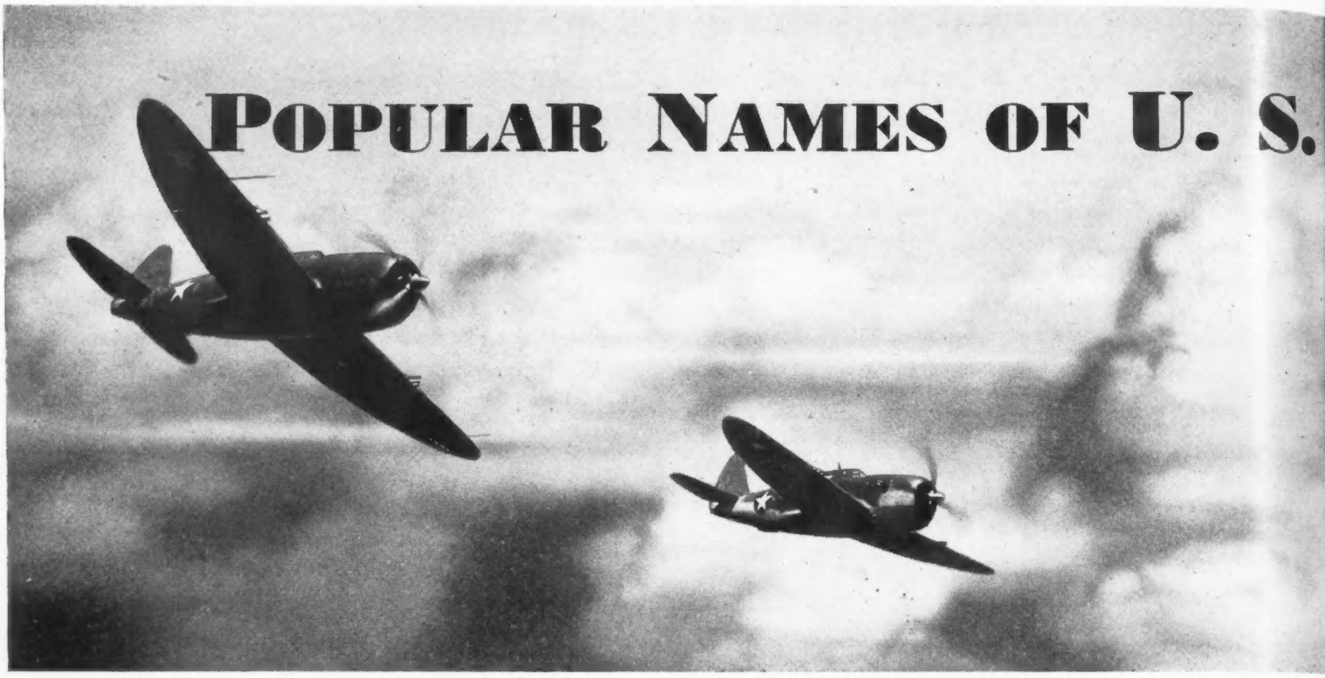
*—Census of Manufacturers and Civil Aeronautics Administration.
(a)—Production for Civil use only.
(b)—Includes value of both military and civilian airplane.
(c)—Included with Value of Airplanes.
(d)—According to report of W. P. B.
(e)—Includes airplanes, engines and propellers.
(f)—Included with value of airplanes.

Airplane [redacted] Production

(Civil and Military)



POPULAR NAMES OF U. S. M



BY TYPE OF AIRCRAFT

Army	Navy and Marine Corps	Name	Original Manufacturer
		HEAVY BOMBERS	
B-17	....	Flying Fortress	Boeing
B-24	PB4Y	Liberator	Consolidated
		MEDIUM BOMBERS	
B-18	....	Bolo	Douglas
B-23	....	Dragon	Douglas
B-25	PBJ	Mitchell	North American
B-26	....	Marauder	Martin
B-34	PV	Ventura	Vega
		LIGHT BOMBERS	
A-20	BD	Havoc (Attack)	Douglas
A-24	*SBD	Dauntless (Dive)	Douglas
A-25	SB2C	Helldiver (Dive)	Curtiss
A-29	PBO	Hudson (Patrol)	Lockheed
A-34	SB2A	Buccaneer (Dive)	Brewster
A-35	....	Vengeance (Dive)	Vultee
....	SB2U	Vindicator (Dive)	Vought-Sikorsky
....	TBD	Devastator (Torpedo)	Douglas
....	TBF	Avenger (Torpedo)	Grumman
		PATROL BOMBERS (FLYING BOATS)	
OA-10	PBY	Catalina	Consolidated
....	PB2Y	Coronado	Consolidated
....	PBM	Mariner	Martin
		FIGHTERS	
P-38	....	Lightning	Lockheed
P-39	....	Airacobra	Bell
P-40	....	Warhawk	Curtiss
P-43	....	Lancer	Republic
P-47	....	Thunderbolt	Republic
P-51	....	Mustang	North American
....	F2A	Buffalo	Brewster
....	F4F	Wildcat	Grumman
....	F4U	Corsair	Vought-Sikorsky

Army	Navy and Marine Corps	Name	Original Manufacturer
		SCOUTING OBSERVATION (SEAPLANES)	
....	SO3C	Seagull	Curtiss
....	OS2U	Kingfisher	Vought-Sikorsky
		TRANSPORTS	
C-43	GB	Traveler	Beech
C-45A	JRB	Voyager	Beech
C-46	R5C	Commando	Curtiss
C-47	....	Skytrain	Douglas
C-53	R4D	Skytrooper	Douglas
C-54	R5D	Skymaster	Douglas
C-56	R5O	Lodestar	Lockheed
C-61	GK	Forwarder	Fairchild
C-69	....	Constellation	Lockheed
C-76	....	Caravan	Curtiss
C-87	....	Liberator Express	Consolidated
....	JR2S	Excalibur	Vought-Sikorsky
PT-13 & 17	N2S1 & 3	Caydet	Boeing
PT-19 & 23	....	Cornell	Fairchild
....	N2T	Tutor	Timm
PT-22	NR	Recruit	Ryan
BT-13 & 15	SNV	Valiant	Vultee
AT-6	SNJ	Texan	North American
....	SNC	Falcon	Curtiss
AT-7	SNB2	Navigator	Beech
AT-8 & 17	....	Bobcat	Cessna
AT-10	....	Wichita	Beech
AT-11	SNB1	Kansas	Beech
AT-13 & 14	....	Yankee-Doodle	Fairchild
AT-15	....	Crewmaker	Boeing
AT-19	....	Reliant	Vultee
		LIAISON	
L-1	....	Vigilant	Vultee
L-2	....	Taylorcraft Grasshopper	Taylorcraft
L-3-C	....	Aeronca Grasshopper	Aeronca
L-4-B	ME	Piper Grasshopper	Piper
L-5	....	Sentinel	Vultee

S. MILITARY AIRCRAFT

ALPHABETICALLY BY NAME

Name	Type Airplane	Army	Navy and Marine Corps	Original Manufacturer
Aeronca Grasshopper	Liaison	L-3-C		Aeronca
Airacobra	Fighter	P-39		Bell
Avenger	Torpedo Bomber		TBF	Grumman
Bobcat	Transport	AT-8 & 17		Cessna
Bolo	Medium Bomber	B-18		Douglas
Buccaneer	Dive Bomber	A-34	SB2A	Brewster
Buffalo	Fighter		F2A	Brewster
Caravan	Transport	C-76		Curtiss
Catalina	Patrol Bomber	OA-10	PBY	Consolidated
Caydet	Transport	PT-13 & 17	N2S1 & 3	Boeing
Commando	Transport	C-46	R5C	Curtiss
Constellation	Transport	C-69		Lockheed
Cornell	Transport	PT-19 & 23		Fairchild
Coronado	Patrol Bomber		PB2Y	Consolidated
Corsair	Fighter		F4U	Vought-Sikorsky
Crewmaker	Transport	AT-15		Boeing
Dauntless	Dive Bomber	A-24	SBD	Douglas
Devastator	Torpedo Bomber		TBD	Douglas
Dragon	Medium Bomber	B-23		Douglas
Excalibur	Transport		JR2S	Vought-Sikorsky
Falcon	Transport		SNC	Curtiss
Flying Fortress	Heavy Bomber	B-17		Boeing
Forwarder	Transport	C-61	GK	Fairchild
Havoc	Attack Bomber	A-20	BD	Douglas
Helldiver	Dive Bomber	A-25	SB2C	Curtiss
Hudson	Patrol Bomber	A-29	PBO	Lockheed
Kansas	Transport	AT-11	SNB1	Beech
Kingfisher	Scouting Observation		OS2U	Vought-Sikorsky
Lancer	Fighter	P-43		Republic
Liberator	Heavy Bomber	B-24	PB4Y	Consolidated
Liberator Express	Transport	C-87		Consolidated
Lightning	Fighter	P-38		Lockheed
Lodestar	Transport	C-56	R5O	Lockheed
Marauder	Medium Bomber	B-26		Martin
Mariner	Patrol Bomber		PBM	Martin
Mitchell	Medium Bomber	B-25	PBJ	North American
Mustang	Fighter	P-51		North American
Navigator	Transport	AT-7	SNB2	Beech
Piper Grasshopper	Liaison	L-4-B	ME	Piper
Recruit	Transport	PT-22	NR	Ryan
Reliant	Transport	AT-19		Vultee
Seagull	Scouting Observation		SO3C	Curtiss
Sentinel	Liaison	L-5		Vultee
Skymaster	Transport	C-54	R5D	Douglas
Skytrain	Transport	C-47		Douglas
Skytrooper	Transport	C-53	R4D	Douglas
Taylorcraft Grasshopper	Liaison	L-2		Taylorcraft
Texan	Transport	AT-6	SNJ	North American
Thunderbolt	Fighter	P-47		Republic
Traveler	Transport	C-43	GB	Beech
Tutor	Transport		N2T	Timm
Valiant	Transport	BT-13 & 15	SNV	Vultee
Vengeance	Dive Bomber	A-35		Vultee
Ventura	Medium Bomber	B-34	PV	Vega
Vigilant	Liaison	L-1		Vultee
Vindicator	Dive Bomber		SB2U	Vought-Sikorsky
Voyager	Transport	C-45A	JRB	Beech
Warbawk	Fighter	P-40		Curtiss
Wichita	Transport	AT-10		Beech
Wildcat	Fighter		F4F	Grumman
Yankee-Doodle	Transport	AT-13 & 14		Fairchild

AIRCRAFT STANDARDS

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Arranged alphabetically below are the aircraft standards that have been adopted by the N.A.S.C. and the S.A.E. Following the title of each standard is the number by which it is designated.

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Copies of the S.A.E. standards may be had from the Society of Automotive Engineers, 29 West 39th St., New York City.

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Copies of the N.A.S.C. standards may be obtained from the National Aircraft Standards Committee, care, Aeronautical Chamber of Commerce of America, Shoreham Building, Washington, D. C.

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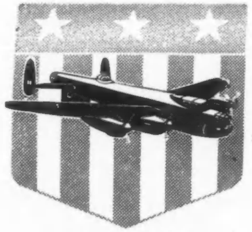

World Military Airplanes—*Grouped by Types*

The following specifications of world military airplanes have been compiled from data published from time to time by the British publications *The Aeroplane* and *Flight*. The planes included are now in service although some few may not still be in production.

MAKE AND MODEL	TYPE	CREW	ARMAMENT	ENGINE No. Used	ENGINE Hp. per Motor	ENGINE Make	DIMENSIONS Span	DIMENSIONS Length	DIMENSIONS Height	DIMENSIONS Wing Area (Sq. Ft.)	WEIGHTS Empty	WEIGHTS Loaded	PERFORMANCE Maximum Speed at Altitude	PERFORMANCE Range Miles at mph	PERFORMANCE Initial Climb (fpm)	PERFORMANCE Service Ceiling (ft)
BOMBERS—GERMAN																
Arado 81V3	Dive	2		1	610	Junkers	36′ 9″	28′ 6″	11′ 9½″	383.0	4,235	6,754	214 @ 13,120	430 @ 171		25,260
Arado 95	Torpedo	2	1-f-mc.g; 1-m-mc.g	1	845	BMW	41′ 0″	35′ 52″	12′ 9½″	480.7	4,983	7,260	185 @ 9,840	800 @ 162	1,640	26,000
Arado 95See	Torpedo-seaplane	3	1-f-mc.g; 1-m-mc.g	1	845	BMW	41′ 0″	36′ 5″	17′ 0″	480.7	5,390	7,854	170 @ 9,840	720 @ 142	1,321	23,944
Blohm und Voss Ha137A	Dive	1	4-f-mc.g, f.f; 1-250 kg. bomb	1	770	BMW	36′ 7″	31′ 0″	13′ 1″	252.8	3,800	5,300	211 @ 8,000	320 @ 185	2,100	23,000
Dornier 17Z2		4	6-m-mc.g	2	1000	Bramo	59′ 0″	52′ 5½″	15′ 9″	592.0	11,484	19,481	275 @ 16,400	745 @ 248		29,600
Dornier D0215		4	mc.g in nose, top & below cabin, f-a	2	1050	Daimler	59′ 1″	53′ 6″	15′ 9″	592.0	11,685	18,960	311 @ 16,400	965 @ 264	1,300	29,600
Dornier Do217(*)	Long range	4		2	1320	BMW	72′ 0″	63′ 5″		930.0	16,800	35,000†	294 @ 19,000	4,500 @ 200		
Dornier Do217E1	Reconnaissance	4	1-f-f, 15 mm. can; 4-m-mc.g	2	1600	BMW	62′ 6″	56′ 6″		620.0		33,500†	309 @ 19,100		638	
Dornier Do217E2	Multi-purpose	4	2-can; 7 mc.g	2	2000	BMW	62′ 5″	58′ 6″		610.0	18,940	33,700	324 @ 18,500	1,500 @ 255	638	22,500
Fock-Wulf Fw200K2KurierII	Reconnaissance	5	2-cannon; 1-mc.g	4	1320	BMW	108′ 6″	78′ 3″	23′ 4″	1,290.0	28,700	44,100	279 @ 18,100	2,300 @ 226	940	28,850
Heinkel He46	Short range	2	1-f-mc.g, f.f; 1-gun, f-a		715	Siemens	46′ 8″	32′ 6″				6,420	147 @ SL	620 @ 119		
Heinkel He59	Multi-purpose	4	1-m-mc.g, f-f; 1-top mc.g; 1-mc.g. below	2	750	BMW	77′ 9″	57′ 1″	23′ 6″	1,649.0	13,673	19,800	137 @ SL	1,090 @ 109	680	11,240
Heinkel 111HaE	Torpedo	6	2-18 in. tar; 6-mc.g; 1-cannon	2	1150	DB	74′ 6″	53′ 7″	13′ 9″	942.0	16,000	27,400	254 @ 13,100	1,100 @ 215	800	24,100
Heinkel 111K2A		4	3-m-mc.g	2	1050	Mercedes	73′ 10″	57′ 5″	12′ 9″	942.0	12,826	27,247	252 @ 11,800	620 @ 214	840	22,000
Heinkel 111K5A		6	6-h-o, mc.g	1	1200	Junkers	74′ 3″	54′ 6″	13′ 9″	942.0	14,400	27,400†	274 @ 12,300	2,140 @ 230■	1,050	24,100
Heinkel He170K1	Reconnaissance	2	1-f-mc.g, f-f; 2-m-mc.g	1	850	BMW	48′ 6″		10′ 1″	392.7						
Heinkel He170K2	Reconnaissance	2	1-f-mc.g, f-f; 2-m-mc.g	1	910	Mercedes	48′ 6″	39′ 4″	10′ 1″	392.7	5,647	9,163	248 @ 12,300	994 @ 236		24,600
Heinkel He177	Heavy	6	2-cannon; 2 or 3 mc.g	2	2300	Mercedes	103′ 4″	67′ 3″	18′ 2″	1,660.0	35,000	82,000†	280 @ 19,000	7,040 @ 180	840†	25,000
Heinkel He270K	Reconnaissance	2	1-f-mc.g, f-f; 2-m-mc.g	1	910	Mercedes	48′ 6″	39′ 0″	13′ 9″	392.7	5,874	9,427	279 @ 13,100	994 @ 267		29,520
Henchel Hs123A	Dive	1	2-f-mc.g; 1-bomb	1	880	BMW	34′ 5″	26′ 3″	9′ 0″	267.3	3,312	4,884	248 @ 9,200	530 @ 223	2,980	29,500
Henchel Hs123B	Dive	1	2-f-mc.g; 1-bomb	1	1000	Bramo	34′ 5″	26′ 3″	9′ 0″	267.3	3,516	4,950	262 @ 12,300			
Henchel Hs123C	Dive	1	2-f-mc.g; 1-bomb	1	1000	Bramo	34′ 5″	26′ 3″	9′ 0″	267.3	3,530	5,000	260 @ 12,300			
Henchel Hs129	Fighter		2-cannon; 4-mc.g	2	450	Argus						9,000	225 @ SL			
Junkers Ju52/3mK	General purpose	4	4-h-o-mc.g	3	660	BMW	95′ 11″	62′ 0″	14′ 10″	1,190.0	14,170	22,000	180 @ 5,500	700 @ 150		20,000
Junkers Ju86K	General purpose	4	3-h-o-mc.g	2	660	Junkers	73′ 10″	57′ 6″	15′ 8″	883.0	12,200	17,770	222 @ 1,000	1,200 @ 170		21,000
Junkers Ju86K1	General purpose	4	3-h-o-mc.g	2	660	Junkers	73′ 9″	58′ 8″	15′ 8″	882.3	11,354	17,770	224 @ 1,000	1,555 @ 174		21,300
Junkers Ju86K2	General purpose	4	3-h-o-mc.g	2	880	BMW	73′ 10″	59′ 0″	15′ 8″	883.0	11,308	18,040	239 @ 9,840	1,242 @ 205	820	24,380
Junkers Ju87A	Dive	2	1-f-mc.g; 1-m-mc.g	1	680	Junkers	45′ 4″	35′ 5″	13′ 11″	344.0	5,020	7,510	198 @ 12,000	620 @ 169	1,540	26,200
Junkers Ju88A1		4	4-m-mc.g	2	1200	Junkers	60′ 3½″	47′ 1″	15′ 5″	540.0	16,870	25,520	310 @ 15,500	960 @ 280(a)		29,800
Junkers Ju88A4		4	7-m-mc.g	2	1200	Junkers	65′ 0″	47′ 1″	15′ 5″				280 @ 15,500	870 @ 252		
Junkers Ju88A6		4		2	1450	Junkers	65′ 0″	47′ 1″	15′ 5″				300 @ 18,500	800 @ 254		
Messerschmitt Jaguar	Reconnaissance	4	4-f-mc.g; 2-m-cannon	2	1150	Mercedes	53′ 4″			414.0			320 @ 16,000			
Messerschmitt Me110	Fighter	2	2-f-can; 4-f-mc.g; 1-m-mc.g	2	1150	Mercedes	53′ 4″	40′ 9″	10′ 9″	414.0	9,900	15,290	365 @ 16,400	1,500 @ 215		35,000
Messerschmitt Me210	Long range	2	2-f-20 mm. can; 4-mc.g	2	1395	Mercedes	53′ 9″	40′ 3″	16′ 6″			20,000	365 @ 19,680	1,500 @ 275		
Messerschmitt Me-20A-1	Fighter	2	2-f-7.9 mm. mc.g; 4-can	2									375 @ 18,000			
BOMBERS—ITALIAN																
Breda Br88	Fighter	3	3-12.7 mm, fsg; 2-7.7 mm; wings	2	1000	Piaggio	50′ 10″	37′ 9″		358.0		14,700	310 @ 13,500	1,450 @ 185†		28,500
Cant Z1007	Long Range	4	1-12.7 mm, d-t; 1-12.7 mm, ven; 2-7.7 mm, lat	3	1000	Piaggio	81′ 4″	60′ 0″	18′ 6″	740.0	19,000	28,600	280 @ 15,000	800 @ 235		26,500
Cant Z506B	Reconnaissance	4	1-12.7 mm, d-t; 1-12.7 mm, ven	3	780	Alfa-Romeo	87′ 0″	63′ 0″	22′ 2½″	936.0	18,040	26,400	230 @ 13,000	1,000 @ 195		24,000
Caproni Ca313	Reconnaissance	3		2	650	Isotto	53′ 6″	38′ 9″	14′ 4″			12,450	249 @			22.300
Caproni Ca316	Seaplane	3		2	450	Piaggio	53′ 2″	40′ 0″		416.0	7,270	10,250		990 @ 167		
Fiat B.G.A.	Heavy	5		2	1050	Fiat	70′ 6″	51′ 7″	15′ 10″			7,240	252 @			30,200
Fiat Br20		3	1-7.7 mm, fsg; 1-12.7 mm, d-t; 1-7.7 mm. ven	2	1000	Fiat	71′ 0″	52′ 9″	14′ 0″	719.0		22,500	255 @ 13,000	1,150 @ 220		25,000
Piaggio P32	Long Range	4	1-7.7 mm, fsg; 2-12.7 mm, d-t; 2-12.7 mm, ven	2	1000	Piaggio						22,000	260 @ 15,000	1,100 @ 220		20,000
Piaggio P50	Heavy	6		4	1000	Piaggio	85′ 3″	65′ 7″	15′ 3″	1,067.0	26,500	42,000	280 @ 14,750	1,250 @ 250		25,000
Piaggio P108C	Transport	6		4	1000	Piaggio	108′ 3″	81′ 6″		1,539.0	33,000	59,000†	292 @	2,500 @		26,000
Piaggio P123R		3		3	1000	Piaggio	95′ 5″	77′ 0″	16′ 4″	985.0	26.500	42,000	274 @ 14,750	2,360 @ 217		23,600
Savoia Marchetti SM79																
Savoia Marchetti SM85	Dive	1		2	1000	Piaggio	52′ 6″	41′ 4″	13′ 3″	418.0			317 @ 13,100			
BOMBERS—JAPANESE																
Aichi LL-98	Reconnaissance	5	1-f-can; 4-f-mc.g; 1-m-can	3	770	Aichi	87′ 0″	63′ 0″	24′ 5″	940.0		26,400	230 @ 13,000	1,000 @ 199		24,000
Aichi K-99	Dive, navy	2	2-f-mc.g, f-f; 1-m-mc.g, f-a	1		Aichi	48′ 0″	37′ 0″								
Fiat-Nichi TB-98	Torpedo, army	5	3-m-mc.g	2	1030	Fiat	70′ 6″	52′ 10″	14′ 1″	796.0	14,300	22,220	268 @ 16,400	1,863 @ 214		29,520
Heinkel-Aichi TB-98	Torpedo, army	6	6-m-mc.g	2	880	BMW	74′ 3″	54′ 6″	13′ 9″	942.0		16,764	239 @ 9,840	870 @ 192		
Kawasaki LB-93	Reconnaissance	2	1-f-mc.g; 1-m-mc.g	1	600	Kawasaki	42′ 8″	32′ 9½″	9′ 10″			6,820	161 @ 1,000			22,960
Kawasaki LB-97	Reconnaissance	2	2-f-mc.g; 1-m-mc.g	1	900	Kawasaki	47′ 8½″			295.0		7,000	236 @ 13,000	490 @ 206		25,000
Kawasaki B-97	Army	5	2-m-can; 4-m-mc.g	2	820	Kawasaki	75′ 0″	62′ 0″	12′ 6″	665.0		20,900	245 @ 15,000	1,250 @ 196		24,500

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World Military Airplanes—*continued*

MAKE AND MODEL	TYPE	CREW	ARMAMENT	ENGINE: No. Used	ENGINE: Hp. per Motor	ENGINE: Make	DIMENSIONS: Span	DIMENSIONS: Length	DIMENSIONS: Height	DIMENSIONS: Wing Area (Sq. Ft.)	WEIGHTS (lb.): Empty	WEIGHTS (lb.): Loaded	PERFORMANCE: Maximum Speed at Altitude	PERFORMANCE: Range Miles at mph	PERFORMANCE: Initial Climb (fpm)	PERFORMANCE: Service Ceiling (ft)
Mitsubishi OB-93-1	Medium, army	5	2-m-mc.g	2	700	Mitsubishi	88′ 6″	49′ 2½″		979.0		17,820	136 @			
Mitsubishi B-93	Medium, army	4	2-m-mc.g	2	450	Makajima	65′ 7″	42′ 7″		602.0		10,120	155 @			
Mitsubishi B-96-1	Medium, navy	3		2	550	Makajima	55′ 0″						240 @	1,800 @		
Mitsubishi H-96	Recon, navy	6	1-cannon; 4-mc.g	3	900	Mitsubishi	96′ 8″	70′ 0″	26′ 3″	2,500.0		38,750	145 @ 10,000	1,400 @ 125		13,000
Mitsub shi K-96	Dive, navy	2	2-f-mc.g; f-f; 1-m-mc.g, f-a	1	730	Mitsubishi	37′ 6″	30′ 9″	12′ 10″	420.0		5,200	200 @ 10,000			23,000
Mitsubishi OB-96-4	Navy	4	6-mc.g	2	1000	Mitsobishi	82′ 0″	52′ 6″	12′ 4″	800.0		22,000	230 @ 10,000	1,615 @ 161		24,000
Mitsubishi OB-96-4A	Navy	4	7-7.7 mm-mc.g	2	1000	Mitsubishi	82′ 0″	52′ 6″	12′ 4″	800.0		22,000	230 @ 10,000	1,615 @ 161		24,000
Mitsubishi B-97Darai	Medium, army			2			48′ 2″	30′ 5″	9′ 5″							
Mitsubishi G-97-1	Torpedo, navy	2	1-f-mc.g, f-f; 2-m-mc.g, f-a	1	900	Mitsubishi	50′ 9″	33′ 11″	14′ 2″	375.0		8,500	195 @ 10,000	470 @ 167(1)		23,000
Mitsubishi KB-97Karigane	Light, army	2	2-f-mc.g; f-f; 1 or 2-m-mc.g	1	550	Makajima	39′ 4″	26′ 11″	11′ 4″	215.0		5,750	310 @	1,490 @		
Mitsubishi OB-97	Army	5	2-m-f-f; 2-m-d; 2-f-1; 1-f-t	2	870	Mitsubishi	72′ 2″	51′ 8″	11′ 11″	675.0	10,450	22,000	220 @ 10,000	2,480 @ 186		22,000
Mitsubishi KB-98KariganeII	Light, army	2	2-f-mc.g, f-f; 1-m-mc.g, f-a	1	900	Mitsubishi	46′ 0″	26′ 2½″	11′ 9″	290.0		7,800	250 @ 11,000	280 @ 208		25,000
Mitsubishi KB-98KariganeIII	Light, army	2	2-f-mc.g, f-f; 1-m-mc.g, f-a	1	900	Mitsubishi	46′ 0″	26′ 2½″	11′ 9″	290.0		7,800	250 @ 11,000	280 @ 208		25,000
Mitsubishi OB-98	Heavy, army	4		2	750	Mitsubishi	75′ 0″	59′ 0″	13′ 1″	685.0		21,000	220 @ 15,000	1,180 @ 185		23,000
Nakajima T-94	Light, army	2	1-f-mc.g, f-f; 1-m-mc.g, f-a	1	550	Makajima	36′ 7″	24′ 5″	9′ 2″	322.5		5,720	186 @ 13,000	470 @ 150		23,000
Nakajima G-96	Torpedo, navy	3	1-m-mc.g; f-a	1	600	Makajima	49′ 0″	33′ 0″	14′ 9″	540.0		7,300	168 @ 8,000	900 @ 145		20,000
Nakajima G-97-2	Torpedo, navy	2	2-f-mc.g, f-f; 1 or 2-m-mc.g, f-a	1	700	Hikari	51′ 2″	34′ 6″								
Potez B-01	Army	2	1-f-mc.g, f-f; 1-m-mc.g, f-a	2	670	Hispano-S	52′ 6″	36′ 3″	9′ 10″	355.0	6,085	9,680	279 @ 13,120	807 @		
BOMBERS—RUSSIAN*																
BB100	Dive															
DB-3F	Medium			2	1100		70′ 2″	46′ 10″					265 @ 16,000	@ 186		
DB-3(CKB-26)	Medium			2	1000								240 @	2,500 @		
IL-2(BSch)Stormovik	Dive															
PE-2	Light			2	1300											
SB-2	Medium			2	860		66′ 0″	40′ 8″					260 @ 12,800	750 @ 186		
SB-3	Medium			2	950		66′ 0″	41′ 6″					280 @	@ 217		
SB-RK	Dive															
SU-2(BB-1)	Light															
TB-6B	Heavy			4	1000											
YAK-4(BB-22)	Light			2	1100											
TB-7	Long range			4	1300	AM-38	120′ 0″						280 @ 25,000	2,500 @ (2)		
BOMBERS—BRITISH—4 ENGINE																
Avro Lancaster I	Long range	6	10-.303 in. mc.g in 4 p-o-t	4	1280	Rolls-Royce	102′ 0″	69′ 4″	20′ 0″	1,297.0	35,000	63,000†	300 @	3,000 @		20,000
Avro Lancaster II	Long range		10-.303 in. mc.g in 4 p-o-t	4	1600	Bristol-Her.	102′ 0″	69′ 4″	20′ 0″	1,297.0	35,000	63,000†	300 @	3,000 @		
Handley-Page Halifax II	Long range			4	1280	Rolls-Royce	99′ 0″	70′ 0″	22′ 0″	1,250.0			300 @	3 000 @		
Short Stirling	Long range	7	8-.303 in. mc.g in 3 p-o-t	4	1600	Bristol-Her.	99′ 1″	87′ 3″	22′ 9″	1,460.0	46,000	70,000	300 @	2,050 @ 227		
Short Sunderland	Long range			4	890	Bristol	112′ 9½″	85′ 4″	32′ 10½″	1,487.0	27,190	50,100†	210 @ 6,500	2,900 @ 178†	720	20,500
BOMBERS—UNITED STATES—4 ENGINE																
Boeing B-17E		9	13-mc.g	4	1200	Pratt & Whitney	103′ 9″	73′ 0″	15′ 6″	1,486.0	33,000	55,000	300 @ 20,000	3,500 @ 245	1,300	40,000
Consolidated B-24	Long range	6-9	9-.500 in. mc.g	4	1200	Pratt & Whitney	110′ 0″	63′ 9″	18′ 2″	1,043.0	32,000	52,000	335 @ 16,000	3,000 @ 230		36,000
Consolidated PB2Y-3	Flying Boat			4	1200	Pratt & Whitney	115′ 0″	79′ 3″	25′ 4″	1,780.0		65,000	220 @ 10,500	5,200 @ 140	690	18,000
BOMBERS—BRITISH—2 ENGINE																
Avro Manchester	Heavy	6	8-.303 in. mc.g in 3 p-o-t	2	1845	Rolls-Royce	90′ 1″	68′ 10″	19′ 6″	1,131.0		56,000	300 @	2,000 @		
Blackburn Botha	Torpedo	4		2	930	Bristol	59′ 0″	51′ 1½″	14′ 7½″	515.0						
Bristol Beaufort	Torpedo	4	8-mc.g and bombs	2	1065	Bristol	57′ 10″	44′ 2″	14′ 5″	503.0			300 @	2,000 @		
Bristol Blenheim IV		3	5 fixed and 1 moveable machine gun	2	1680	Bristol	56′ 4″	42′ 9″	9′ 10″	469.0	8,250	14,400	295 @ 15,000	1,900 @ 220	1,540	27,000
DeHaviland Mosquito	Reconnaissance		4-20 mm. can; 4-.303 in. mc.g	2		Rolls-Royce	54′ 2″	40′ 9″	15′ 3″	420.0						
Handley-Page. Hampden	Medium	4		2	980	Bristol	69′ 2″	53′ 7″	14′ 11″	668.0	11,780	18,756	265 @ 15,000	2,000 @ 217	980	22,700
Handley-Page Hereford				2	980	Bristol										
Hawker-Siddeley Whitley	Heavy	4		2	1010	Rolls-Royce	84′ 0″	70′ 6″	15′ 0″	1,137.0	19,200	27,900	230 @ 17,750	2,200 @ 210		26,000
Vickers Wellington Ic	Long range	6	2-mc.g	2	965	Bristol	86′ 2″	64′ 7″	17′ 5″	840.0	15,887	28,500	250 @ 15,000	3,200 @ 180	1,120	24,000
Vickers Wellington III	Long range	6		2	1370	Bristol-Her.	86′ 2″	64′ 3″	17′ 5″	840.0			265 @ 15,000	3,200 @ 180		25,000
BOMBERS—UNITED STATES—2 ENGINE																
Consolidated PBY-5A	Flying boat		6-mc.g and bombs	2	1200	Pratt & Whitney	104′ 0″	65′ 2″	18′ 6″	1,400.0	16,500	31,000	190 @ 10,500	4,000 @ 130	1,100	25,700
Douglas B-18A	Medium			2	1200	Wright	90′ 0″	56′ 9″	15′ 1″	987.0	17,800	26,000	225 @ 6,500	1,200 @ 182	1,050	25,000
Douglas B-23	Medium	6		2	1600	Wright	92′ 0″	58′ 4″	18′ 5″	987.0	19,000	26,500	294 @ 13,250	1,455 @ 261	1,660	31,200
Douglas A-20	Boston III		7-mc.g and bombs	2	1275	Wright	61′ 4″	47′ 4″	18′ 1″	464.8			350 @ 12,000			
Lockheed Hudson		4	7-guns	2	1200	Wright	65′ 6″	44′ 3″	11′ 10″	551.0	12,356	18,500	284 @ 15,000	2,160 @ 225	2,215	24,500
Martin Marauder B-26		6		2	1850	Pratt & Whitney	65′ 0″	58′ 3″	19′ 0″			26,625	346 @	2,400 @ 313		34,500
Martin Mariner PBM-2		3		2	1600	Pratt & Whitney	118′ 0″	77′ 2″	17′ 6″	1,330.0		40,000	250 @ 5,000	3,200 @ 165	557	17,000
Martin Maryland			4-f-mc.g; 2-m-mc.g	2	1050	Pratt & Whitney	61′ 4″	46′ 8″	10′ 0″	538.5	10,586	15,297	304 @ 13,000	1,300 @ 248	1,790	29,500
Martin Baltimore	Medium	4	8-mc.g in wings; 3 mc. g.	2	1600	Wright	61′ 4″	48′ 6″	17′ 9″	538.5			315 @			
North American B-25C	Medium	5		2	1700	Wright	67′ 7″	51′ 5″	14′ 10″	610.0	16,000	24,000	310 @ 13,000	1,728 @ 256	1,880	26,500
Vega Venturi-B-34				2	2000	Pratt & Whitney	65′ 6″	57′ 6″		551.0						

* Source—Aircraft Engineering who state: "These figures have been obtained from enemy sources and must not be taken as official."

BOMBERS—BRITISH—1 ENGINE

Blackburn	Skua	Dive	2		1	745	Bristol	46' 2"	35' 4¼"	12' 6"	312 0	5,847		225 @ 6,500	@ 187		20,200
Blackburn	Roc		2		1	905	Bristol	46' 0"	35' 7"	12' 1"							
Fairey	Battle	Reconnaissance			1	990	Rolls-Royce	54' 0"	52' 2"	15' 6"	422.0	6,647	10,792	257 @ 15,000	1,000 @ 200		25,000
Fairey	Fulmar	Reconnaissance		8-f-mc.g, f-f	1	1145	Rolls-Royce	46' 0"	40' 6"	14' 0"				284 @ 17,200			
Fairey	Sword Fish			1-f-mc.g, f-f; 1-mc.g, f-a	1	775	Bristol	45' 6"	36' 4"	12' 10"		4,195	7,720	154 @	@ 131		19,250
Westland	Lysander	All purpose	2		1	905	Bristol	50' 0"	30' 6"	14' 6"	260.0	4,160	6,015				

BOMBERS—UNITED STATES—1 ENGINE

Brewster	Buccaneer SB2A	Dive	2		1	1700	Wright	47' 0"	38' 11"	15' 8"	379.0	7,490	12,256	300 @ 12,000	695 @		23,000
Curtiss	Cleveland SBC-4				1	850	Wright	34' 0"	27' 5"	10' 3½"	317.0	4,548	6,256	235 @ 15,000	855 @ 176		24,500
Curtiss	Helldiver SB2C	Dive	2		1	1700	Wright	49' 8"	35' 2"	16' 8"	422.0	7,868	10,982				
Douglas	Devastator TBD	Torpedo	3		1	825	Pratt & Whitney	50' 0"	35' 6"	18' 1"			9,300	225 @ 9,000	985 @ 180		
Douglas	Dauntless A-24	Dive	2		1	950	Wright	41' 6"	31' 9"	13' 0"	335.0			275 @ 7,500			
Northrup	A-17		3		1	1050	Pratt & Whitney	47' 10"	32' 5"	9' 9"	362.0	3,247	4,375	260 @ 1,500	900 @ 146	1,100	17,400
Grumman	Avenger TBF	Torpedo		5-mc.g; 1 Torpedo	1	1700	Wright	53' 0"	37' 0"				12,000	270 @ 7,500	1,400 @ 215		20,000
Vought-Sikorsky	SB-2U	Dive		4-mc.g in wings	1	750	Pratt & Whitney	42' 0"	33' 10"	9' 10"	305.3		4,724	257 @	700 @		28,200
Vultee	Vengeance A-35	Dive	2		1	1600	Wright	48' 0"	40' 0"	12' 10"				303 @			

FIGHTERS—GERMAN

Arado	197	Shipboard	1	2-f-mc.g	1	880	BMW	36' 0"	30' 6"	10' 10"	293.7	3,610	4,600	220 @ 9,000			
Focke-Wulf	Fw159		1	2-f-mc.g, f-f	1	1000	Daimler										
Focke-Wulf	Fw187		2	2-can, f-f; 4-mc.g, f-f	2	1150	Daimler	50' 6"	33' 6"		300.0		12,000	362 @ 19,685		3,450	38,940
Focke-Wulf	Fw190		1	8-mc.g	1	1320	BMW	37' 0"					7,000	370 @ 19,000	525 @ 300		40,000
Focke-Wulf	Fw190A3		1	4-f-can; 2-f-mc.g	1	1600	BMW	34' 5"	29' 4"		203.0	6,240	8,500	375 @ 18,000	525 @ 275	3,000	37,000
Heinkel	He112B		1	2-mc.g; 2-can in wings	1	910	Mercedes	29' 10"	29' 6"	12' 1½"	183.0	4,120	5,740	352 @ 12,300	710 @ 280	2,755	31,000
Heinkel	He113		1	1-20 mm. can; 2 mc.g in wings	1	1360	Mercedes	30' 10"	26' 10"	8' 3"	156.0			380 @ 19,000			
Henschel	Hs129	Close-support	1	2-can; 4-mc.g	2	450	Argus	50' 0"	38' 0"				9,000	225 @ SL			
Junkers	Ju88B	Intruder	3		2	1200	Junkers	60' 3½"	49' 2"		540.0			321 @ 15,500	960 @ 280		
Messerschmitt	Me109E		1	2-mc.g; 2-cannons	1	1150	Mercedes	30' 3¼"	26' 8"	7' 5½"	176.5	4,180	5,520	345 @ 12,300	560 @ 248	3,100	36,000
Messerschmitt	Me109F		1	1-f-can; 2-f-mc.g	1	1085	Mercedes	32' 8"	29' 8"	8' 6"	173.0	4,740	6,090	371 @ 22,000	370 @ 307	3,200	40,000
Messerschmitt	Me109F2		1	1-f-15 mm. can; 2-f-mc.g	1	1150	Mercedes	32' 8"	29' 8"	8' 6"	173.0		6,090	375 @ 22,000		32,000	40,000
Messerschmitt	Me110																
Messerschmitt	Me110C5	Long range .	2	2-f-can; 4-f-mc.g; 1-m-mc.g	2	1200	Mercedes	53' 4"	40' 9"	11' 6"	380.0		16,000	310 @			

FIGHTERS—ITALIAN

Breda	Br88		3	3-12.7 mm, fsg; 2-7.7 mm. in wings	2		Piaggio		38' 0"		358.0		14,700	310 @ 13,000	900 @ 265		28,500
Caproni	Ca335 Maestrale	Escort	2		1												
Fiat	CR42		1	1-7.7 mm, fsg; 1-12.7 mm	1	840	Fiat	32' 0"	27' 0"	11' 0"	237.0		5,100	270 @ 13,000	460 @ 232		31,000
Fiat	G50		1	2-12.7 mm, fsg; 2-7.7 mm. in wings	1	840	Fiat	35' 9"	25' 6"		196.0		5,200	290 @ 14,500	260 @ 250		32,000
Macchi	C200		1	2-12.7 mm, fsg; 2-7.7 mm in wings	1	840	Fiat	35' 0"	27' 0"	11' 6"	161.0		4,850	305 @ 15,000	280 @ 265		33,000
Macchi	C202		1	2-12.7 mm, fsg	1	1200		35' 0"	20' 5"				6,300	330 @ 18,000	@ 300		34,000
Meridionali	Ro43	Navy	2	1-7.7 mm, fsg; 1-7.7 mm	1	700	Piaggio						5,400	186 @ 8,000	440 @ 155		26,000

FIGHTERS—JAPANESE

Kawasaki	I-95		1	3-f-mc.g, f-f	1	600	Kawasaki	33' 0"	26' 2½"	9' 10"	230.0		4,000	250 @ 13,000	300 @ 216		33,000
Kawasaki	S-98		1	2-f-can; 2-f-mc.g	1	820	Kawasaki	29' 0"	23' 0"	10' 2"	236.0		5,000	270 @ 10,000	400 @ 216		32,000
Messerschmitt	S-01	Army	1	2-f-can; 2-f-mc.g	1	1150	Mercedes	30' 3½"	28' 8"	7' 5½"	174.0	4,180	5,520	354 @ 12,300	561 @ 248		36,000
Messerschmitt	S-01	Navy	2	2-f-can; 4-f-mc.g; 1-m-mc.g	1	1200	Mercedes	53' 4"	40' 9"	11' 6"	380.0	9,900	15,290	350 @ 19,000	1,500 @ 215		32,000
Mitsubishi	S-96-2	Navy	1	2-7.7 mm, fsg; 2-7.7 nn-mc.g	1	730	Mitsubishi	36' 0"	24' 6"	9' 9"	170.0		4,300	250 @ 9,000	440 @ 217		31,000
Mitsubishi	S-97	Navy	1	2-7.7 mm, fsg	1	650	Mitsubishi	40' 0"	25' 0"		170.0		4,500	265 @ 11,000	590 @ 225		30,000
Mitsubishi	S-00	Navy	1	2-f-can, f-f; 2-f-mc.g, f-f	1	1100	Nakajima	39' 5"	28' 5"	9' 0"	256.0		5,140	315 @ 10,000	590 @ 265		36,000
Nakajima	S-91	Army	1	2-f-mc.g, f-f	1	450	Nakajima	36' 0"	23' 11"	10' 2"	215.2		3,300	192 @ 9,840	372 @		28,000
Nakajima	S-97	Army	1	2-f-mc.g, f-f	1	800	Hikari	36' 0"	24' 0"	8' 0"	140.0		4,400	270 @ 15,000	340 @ 234		33,000
Nakajima	S-97	Navy	1	3-f-mc.g, f-f	1	750	Nakajima	35' 6"	25' 7"	7' 0"	160.0		4,300	270 @ 15,000	460 @ 233		32,000
Nakajima	SKT-97	Navy	2	2-f-mc.g, f-f; 2-mc.g, f-a	1	750	Nakajima	36' 9½"	33' 6"	11' 5"	185.0		5,300	220 @ 13,000	320 @ 190		27,000
Seversky	S-98	Navy	2	2-f-mc.g, f-f; 1-m-mc.g, f-a	1	950	Pratt & Whitney	36' 0"	26' 10"	9' 9½"	225.0	4,446	6,022	315 @ 14,300	675 @ 285		30,000
Showa	SB-99	Army	2	2-f-can, f-f; 1-f-mc.g, f-f; 1-m-mc.g	1	850	Showa	50' 0"	37' 5½"	9' 11"	384.0	6,375	9,712	220 @ 6,800	950 @ 180		26,000

FIGHTERS—RUSSIAN

	I-16C Super Rata																
	I-17(CKB-19)																
	I-26				1	1100											
	I-153 Chicka																
	MIG-3				1	1200								360 @			
	SU-2(BB-1)																

FIGHTERS—BRITISH

Bristol	Beaufighter		2	4-20 mm. can; 6-mc.g in wings	2	1425	Bristol	57' 10"	41' 4"	15' 10"	502.0	13,800	21,000	330 @ 14,000	1,500 @ 200	1,850	28,900
Westland	Whirlwind				2	885	Rolls-Royce	45' 0"	31' 6"	11' 7"				353 @ 16,350			
Boulton Paul	Defiant		2	4-.303 in. mc.g	1	1030	Rolls-Royce	39' 6"	35' 4"	11' 4"	250.0		7,500	300 @ 16,500			
Gloster	Sea Glaulator			4-mc.g	1	850	Bristol	32' 3"	27' 5"	10' 4"	323.0			255 @	500 @		32,800
Hawker	Hurricane II			12 mc.g or 4-cannon	1	1300	Rolls-Royce	40' 0"	32' 3"	13' 3"	257.6		7,330	355 @ 18,503			35,000
Hawker	Tornado				1												
Hawker	Typhoon				1												
Supermarine	Spitfire				1	1300	Rolls-Royce	36' 10"	29' 11"	11' 5"	242.0	4,332	5,750	387 @ 18,400		2,300	36,000

continued on page 108

World Military Airplanes—*concluded*

MAKE AND MODEL	TYPE	CREW	ARMAMENT	ENGINE No. Used	ENGINE Hp. per Motor	ENGINE Make	DIMENSIONS Span	DIMENSIONS Length	DIMENSIONS Height	DIMENSIONS Wing Area (Sq. Ft.)	WEIGHTS Empty	WEIGHTS Loaded	PERFORMANCE Maximum Speed at Altitude	PERFORMANCE Range Miles at mph	PERFORMANCE Initial Climb (fpm)	PERFORMANCE Service Ceiling (ft)
FIGHTERS—UNITED STATES																
Lockheed Lightning P-38	Intercepter	1		2	1150	Allison	52′ 0″	37′ 10″	9′ 10″	327.0			404 @ 16,000	1,200 @ 350		30,000
Bell Airacobra P-39		1	1-can; 2m.c.g. fsg; 4 in wings	1	1150	Allison	34′ 0″	29′ 9″	9′ 3″	213.0	5,347	7,378	358 @ 15,000	1,000 @ 335	3,750	35,000
Brewster Buffalo F-2A		1	4-.500 mc.g	1	1200	Wright	35′ 0″	25′ 8″	12′ 1″	209.0		6,840	325 @ 15,000	1,428 @	2,070	30,650
Curtiss Mohawk P-36		1	6-mc.g	1	1265	Wright	37′ 3½″	28′ 9½″	9′ 3″	236.0	4,541	5,750	330 @ 15,100	677 @ 262		32,700
Curtiss Tomahawk P-40-C		1	6-mc.g	1	1150	Allison	37′ 3½″	31′ 8″	10′ 8″	236.0			360 @ 15,000	945 @ 315		35,000
Curtiss Kittyhawk P-40-D		1	6-.500 mc.g in wings	1	1150	Allison	37′ 3½″	31′ 8¾″	10′ 9″	236.0				800 @		
Curtiss Warhawk P-40F		1		1	1260	Rolls-Royce	37′ 3″	31′ 9″	10′ 9″	236.0			370 @	800 @		
Grumman Wildcat F4F-3		1	4-mc.g in wings	1	1200	Wright	38′ 0″	28′ 10″	9′ 2½″	260.0	4,429	5,876	325 @ 15,500	1,150 @ 285	3,300	28,000
North American Mustang P-51		1		1	1150	Allison	37′ 3″	32′ 2″	11′ 8″	236.0	5,990	7,708	370 @ 15 000			
Republic Lancer P-43		1		1	1100	Pratt & Whitney	36′ 0″	28′ 5″	10′ 2″	233.7	5,627	7,155	375 @ 23,000	1,000 @ 310		
Republic Thunderbolt P-47		1		1	2000	Pratt & Whitney	41′ 0″	32′ 8″	13′ 0″		13,500		400 @			40,000
Vought-Sikorsky Corsair F4U		1		1	2000	Pratt & Whitney	40′ 0″	31′ 6″					366 @ 16 500			
Vultee Vanguard P-66		1		1	1200	Pratt & Whitney	36′ 0″	28′ 0″	9′ 0″				350 @ 15,100			
RECONNAISSANCE—GERMAN																
Arado 196	Seaplane	2	2-cannon; 2-mc.g, f-f; 1-m-mc.g	1	920	Brama	49′ 6″	38′ 6″	16′ 5″	408.0	6,580	8,200	193 @ 13,000	670 @ 158	980	23,000
Arado 198							48′ 10″	38′ 8½″	14′ 9″	378.0						
Blohm und Voss Ha138	Flying-boat	5	3-single gun turrets	3	600	Junkers	88′ 7″	65′ 3″	18′ 10″	1,204.0	17,820	26,180	171 @ SL	1,490 @ 146	729	16,000
Blohm und Voss Br138B	Flying-boat	5	2-single gun turrets; 1-mc.g, h-o	3	600	Junkers	88′ 7″	65′ 3″	19′ 10″	1,104.0	17,820	26,180	171 @ SL	1,490 @ 146	729	16,000
Blohm und Voss Ha139B	Float-plane	4	2-f-mc.g, f-f; m.mc.g, f-a	4	600	Junkers	96′ 9″	64′ 6″	15′ 9″	1,399.0	22,902	38,610	202 @ SL	3,230 @ 168	656	14,100
Blohm und Voss Ha140	Seaplane	3		2	880	BMW	68′ 10″	57′ 9″	20′ 0″	941.0	13,860	18,700	199 @ 13,000	715 @ 180	850	23,000
Blohm und Voss Bv141B		2	f-mc.g; f-f	1	1580	BMW	63′ 0″	49′ 0″				9,700	278 @ 17,000			
Dornier Do18K1	Flying-boat	4	m-mc.g, f-f; midship turret	2	600	Junkers	77′ 9″	63′ 1″	17′ 9″	1,054.5	12,265	22,000	161 @ 1,000	3,220 @ 140		14,760
Dornier Do18K2	Flying-boat	5	1-mc.g, h-o; 1 turret	2	865	BMW	77′ 9″	63′ 1″	18′ 0″	1,054.5	12,600	30,000	186 @ 7,200	2,700 @ 161	830	17,400
Dornier Do24	Flying-boat	6	3-single gun turrets	3	760	BMW	88′ 7″	72′ 2″	17′ 10″	1,162.0	17,000	29,770	195 @ 5,900	2,050 @ 161		17,390
Dornier Do26K	Flying-boat	4	1-23 mm. can; 2-mc.g, h-o	4	600	Junkers	98′ 6″	80′ 6″	22′ 6″	1,290.0			208 @ 1,000	5,100 @ 140		
Heinkel He114	Float-plane	2	1-f-mc.g, f-f	1	830	BMW	44′ 6″	39′ 0″	16′ 11″	455.0	5,940	7,656	193 @ 8,400	560 @ 143	1,090	15,750
Heinkel He115K2	Mine-Laying	3	2-m-mc.g	2	850	BMW	72′ 10″	56′ 9″	21′ 8″	941.5	13,530	20,790	217 @ 11,150	1,305 @ 186	728	21,320
Heinkel He116P	High	4		4	270	Hirth	72′ 2″	45′ 0″	12′ 5″	677.0	9,592	15,686	233 @ 9,840	2,795 @ 198	820	21,650
Junkers Ju86P2	High	3		2	1000	Junkers	77′ 0″	53′ 0″	15′ 8″			18,000	230 @			40,000
Messerschmitt Me208	Liaison	4		1	270	Argus	34′ 5″	27′ 2″	7′ 6½″	172.2			197 @ SL	620 @ 188		20,340
RECONNAISSANCE—ITALIAN																
Caproni Ca313				2	650	Isotto-Fra.							249 @			
Breda 75			No official data available	1												
RECONNAISSANCE—JAPANESE																
Aichi LL-97	Float-plane	2	1-f-mc.g; 1-m-mc.g	1	770	Aichi	42′ 7″	32′ 6″	13′ 7″	430.0		5,630	180 @ 13,000	410 @ 155		
Consolidated LL-98	Flying-boat	6	4-m-mc.g	2	1200	Pratt & Whitney	104′ 0″	65′ 1″	18′ 6″	1,400.0	14,538	27,080	190 @ 10,500	400 @ 130		25,700
Kawanishi LL-90-2	Flying-boat	6	4-m-mc.g	3	825	Kawanishi	101′ 8″	72′ 2″				33,000	133 @ 9,840	1,600 @ 107		
Kawanishi LL-91	Flying-boat	5	2-m-mc.g	2	600	Kawanishi	77′ 7″						139 @ 9,840	2,300 @ 111		
Kawanishi LL-94	Float-plane	3	1-f-mc.g; 1-m-mc.g	2	600	Kawanishi	46′ 0″	34′ 0″	15′ 5″	530.0		6,100	140 @ 5,000	550 @ 120		18,000
Kawanishi LL-97	Flying-boat	10		4	900	Mitsubishi	131′ 0″	81′ 0″	20′ 0″			45,000	215 @ 13,000	1,500 @ 165		26,000
Kawanishi LL-97-2	Float-plane	2	1-f-mc.g; 1-m-mc.g	1	650	Kawanishi	45′ 6″	38′ 0″	13′ 9″	680.0		8,000	155 @ 7,000	450 @ 135		19,000
Kawanishi LL-97-3	Flying-boat	4	6-m-mc.g	4	720	Liore	104′ 0″	69′ 5″	23′ 5″	1,410.0	21,560	32,912	208 @ 6,560	930 @ 158		
Mitsubishi T-92	Army	2	1-f-mc.g; 1-m-mc.g	1	420	Mitsubishi	41′ 8″	17′ 10″	9′ 10″		3,960	5,500	137 @	526 @ 109		19,680
Nakajima KT-90-2	Float-plane	2	1-f-mc.g, f-f; 1-m-mc.g	1	450	Nakajima	39′ 4″	29′ 6″				5,500	168 @			
Nakajima KT-95	Float-plane	2	1-f-mc.g, f-f; 1-m-mc.g, f-a	1	660	Nakajima	36′ 1″	27′ 11″	13′ 1″	330.0		5,800	160 @ 11,000	500 @ 135		18,000
RECONNAISSANCE and OBSERVATION—BRITISH																
Percival Q6				2	205	D. H. Gipsey	46′ 8″	32′ 3″	9′ 9″		3,600	5,550	195 @ SL	700 @ 181	1,150	21,000
Percival Vega Gul				1	205	D. H. Gipsey	39′ 6″	25′ 4″	7′ 4½″	197.0	1,740	3,250	174 @	660 @ 170		
RECONNAISSANCE and OBSERVATION—UNITED STATES																
Aeronca L-3		2		1	65	Continental	35′ 10″	21′ 10″	9′ ¾″	169.0	761	1,200	87 @	218 @ 79	365	10,000
Curtiss SO3C	Seagull	2		1	520	Ranger	38′ 0″	36′ 10″	15′ 0″	290.0	4,284	5,729				
Piper L-4B				1	65	Continental	35′ 2½″	22′ 3″	6′ 8″	178.0	635	1,100	92 @	260 @ 82	650	12,000
Taylorcraft L-2		2		1	65	Continental	35′ 5″	22′ 9″	7′ 0″	180.0	1,200		102 @	300 @ 92	600	15,000
Vought-Sikorsky OS2U-1		2		1	450	Pratt & Whitney	35′ 11″	33′ 7″	14′ 8″	261.9	3,335	4,980	171 @ 5,000	908 @ 152		18,200
Vultee Vigilant L-1		2		1	280	Lycoming	51′ 0″	34′ 0″	10′ 0″		2,591	3,322	133 @	@ 121	1,160	20,000
Vultee Sentinel L-5		2		1	280	Lycoming	51′ 0″	34′ 0″	10′ 0″		2,591	3,322	133 @	@ 121	1,160	20,000

					1	450	Pratt & Whitney	33' 11"	35' 7"	14' 8"	261.9	3,335	4,980	171 @ 5,000	908 @ 152		18,200
Vultee Vigilant	L-1		2		1	280	Lycoming	51' 0"	34' 0"	10' 0"		2,591	3,322	133 @	@ 121	1,160	20,000
Vultee Sentinel	L-5		2		1	280	Lycoming	51' 0"	34' 0"	10' 0"		2,591	3,322	133 @	@ 121	1,160	20,000

TRANSPORT—GERMAN

Ago	Ao192			6 pass	2	240	Hirth	45' 0"	34' 2"	11' 9"	276.0	3,960	6,220	208 @ SL	650 @ 171		16,400
Blohm und Voss	Bv222				6	1000	BMW	150' 0"	112' 0"				100,000	109 @ 9,840			
DFS	230A1	Glider	1	9 pass. and freight				69' 11"	37' 0"	9' 4"	410.0	1,700	4,500	100 @ 1,000			
Dornier	18E&F	Mail Carrier	4		2	560	Junkers	86' 3"	63' 1"	17' 8"	1,196.5	12,760	24,200	155 @ SL	3,600 @ 137		18,370
Dornier	Do23	Bomber	4	3-mc.g, h-o	2	750	BMW	84' 0"	61' 7"	17' 8"	1,163.0	12,320	20,240	162 @ 1,000	930 @ 130	886	13,776
Focke-Wulf	Fw189	Army	3	1-f-can, f-f; 4-f-mc.g, f-f; 1-mc.g, h-o	2	450	Argus	60' 4"	39' 4"		409.0	5,920	7,480	222 @ 8,500		1,640	27,550
Gotha		Glider		14 mc.g				72' 0"	48' 0"			1,800	4,500	100 @ SL			
Gotha	Go242	Glider	2	21 passengers and freight				79' 0"	52' 6"	11' 4"	762.0	3,200	8,500				
Heinkel	He70		2	4 passengers	1	660	BMW	48' 7"	39' 4"	10' 2"	292.9	5,566	7,612	224 @ SL	560 @ 103	1,310	18,000
Heinkel	He111a		2	10 passengers	2	660	BMW	74' 3"	56' 2"	12' 9"	947.0	12,120	17,350	213 @ SL	930 @ 186	1,090	
Henschel	Hs126	Army cooperation	2	1-f-mc.g, f-f; 1-m-mc.g	1	870	BMW	47' 6¾"	35' 7"	12' 3½"	340.0	4,466	6,798	220 @ 9,840	680 @ 197	1,870	27,880
Junkers	F13	Communications	2	4-6 passengers	1	310	Junkers	58' 3"	34' 7"	11' 6"	473.7	3,080	5,300	126 @ SL	400 @ 110		17,400
Junkers	W33	Communications	2	2-4 passengers	1	310	Junkers	58' 3"	34' 6"	11' 7"	473.7	3,220	5,960	132 @ SL	400 @ 106	550	17,720
Junkers	W33W	Float-plane	2	2-4 passengers	1	310	Junkers	58' 3"	35' 9"	12' 10"	473.7	3,930	5,950	118 @ SL	400 @ 93	470	15,400
Junkers	Ju52/3mW	Ambulance	2	15-17 passengers, 2-mc.g	3	660	BMW	95' 11"	64' 0"	17' 9"	1,190.0	15,640	22,050	172 @ 3,000	710 @ 150	660	16,070
Junkers	Ju52/3mZ	Glider tug	3	12 chutists or 17 troopers	3	845	BMW	95' 11"	62' 0"	14' 10"	1,190.0	16,320	27,550	207 @ 8,500	806 @ 185	1,020	22,250
Junkers	60		2	6 passengers	1	600	BMW	46' 11"	38' 10"	12' 9"	377.0	4,460	6,850	173 @ 3,000	745 @ 148	888	17,000
Junkers	Ju90B		4	40 passengers	4	820	BMW	114' 10"	86' 3"	21' 3"	1,980.0	35,200	50,600	216 @ 3,610	1,305 @ 185	890	18,040
Junkers	160		2	6 passengers	1	670	BMW	46' 9"	39' 4"	13' 2"	377.0	6,105	7,810	211 @ 3,000	745 @ 180	885	17,710
Junkers	Ju290		4	Approx. 50 troops	4	1000	Fafnir	123' 0"	86' 3"	21' 3"			55,000	250 @	1,300 @		20,000
Messerschmitt	Me108A	Communications	4		1	270	Aegus	34' 5"	27' 2"	7' 6½"	172.2	1,887	3,087	196 @ SL	620 @ 187		20,340
Siebel	Fh104A	Communications	5		2	280	Hirth	39' 5"	31' 1"	8' 8"	240.0	3,550	5,180	220 @ SL	590 @ 196	1,312	20,000

TRANSPORT—JAPANESE

Douglas	DC-3		3	21 passengers	2	1000	Wright	95' 0"	64' 5½"	16' 11"	987.0	16,398	25,200	219 @ 7,700	1,620 @ 196	1,200	21,900
Junkers	MC-95		3	17 passengers	3	770	BMW	95' 11"	62' 0"	14' 10"	1,190.0	12,550	23,200	189 @ 13,000	546 @ 160		19,000
Heinkel	MC-98		4	8 passengers	4	270	Hirth	72' 2"	44' 11"	12' 5½"	677.0	9,592	15,686	233 @ 9,840	2,795 @ 198		21,650
Lockheed	14(WG3)		3	12 passengers	2	820	Wright	65' 6"	44' 2½"	11' 5½"	586.0	11,025	17,500	257 @ 9,300	1,705 @ 205		24,700
Mitsubishi	Hinazura	Communications	1	8 passengers	2	240	Mitsubishi	52' 4"	34' 6"	9' 6"	339.0	3,775	5,850	174 @			16,500
Mitsubishi	MC-20 (Army Y-98)		2	11 passengers	2	850	Mitsubishi	74' 0"	52' 8"	16' 0"	755.0	11,900	18,300	266 @	1,240 @ 193		23,000
Mitsubishi	Karigane II	Communications	2		1	800	Mitsubishi	39' 4¾"	27' 11"	11' 6"	258.0		5,060	310 @ 10,000	1,490 @ 200		
Osaka	RK-97	Cooperation	3					34' 0"	25' 9"	10' 6"							
T.G.D.	T.R.1		2	4 passengers	2	240	T.G.D.	47' 11"	34' 9"	9' 0"	269.0	3,014	5,500	180 @	1,120 @ 155		19,680
Tatikawa		Ambulance	2	2 stretcher cases	1	130	Cirrus	32' 9½"	25' 10"	7' 9½"	236.7	1,328	2,294	112 @ 1,000			

TRANSPORT—RUSSIAN

	PS-35(Ant-35)																
	PS-84		3	25 passengers	2	1100	Wright	95' 0"	64' 5½"	16' 11"	987.0	16,398	25,200**	219 @ 7,700	1,620 @ 196	1,200	21,900
	PS-89																
	U-2	Ambulance															

TRANSPORT—BRITISH

DeHaviland	Albatross				4	375	D. H. Gipsey	105' 0"	71' 6"	22' 3"	1,078.0	21,230	29,500		@ 210	1,018	17,900
Bristol	Bombay		4	24 passengers	2	890	Bristol	95' 9"	69' 2"	19' 6"	1,340.0	13,800	20,000	192 @ 6,500	2,230 @ 160	750	25,000
DeHaviland	Flamingo				2	930	Bristol	70' 0"	50' 7"	15' 3"	651.0	12,020	17,600	239 @ 6,500	1,210 @ 200		20,900
DeHaviland	89				2	200	D. H. Gipsey	48' 0"	34' 6"	10' 3"	336.0	3,230	5,550	157 @ SL	556 @ 132	867	

TRANSPORT—UNITED STATES

Beech Traveler	C-43		4														
Beech Voyager	C-45A		5		2	450	Pratt & Whitney	48' 0"	34' 0"					235 @	1,000 @ 220		25,000
Curtiss Commando	C-46		4	40 passengers	2	2000	Pratt & Whitney	108' 0"	76' 4"	22' 0"	1,360.0	26,846	40,000	242 @ 13,000	1,500 @ 195		24,200
Douglas Skytrain	C-47		3	28 passengers	2	1200	Pratt & Whitney	95' 0"	64' 5½"	16' 11"	987.0	16,865	25,200	229 @ 8,800	2,125 @ 208	1,050	23,700
Douglas Skytrooper	C-53		3		2	1200	Pratt & Whitney	95' 0"	64' 5½"	16' 11"	987.0						
Douglas Skymaster	C-54				4	1200											
Lockheed Lodestar	C-56				2	1100	Wright	65' 6"	49' 10"	11' 10½"	551.0	11,780	17,500	259 @ 16,700	1,700 @ 241	2,010	28,000
Lockheed Constellation	C-69				4	2000	Wright								4,000 @ 283		30,000
Curtiss Caravan	C-76				2												
Consolidated Lib. Exp.	C-87				4	1200	Pratt & Whitney										

ABBREVIATIONS:

*—These details are approximate and should be taken only as general indications

**—Details unknown but include retractable, electrically operated turret on top of fusilage

†—Overload 35,000 pounds

‡—14-cylinder radial motor with fully enclosed cowling

●—Maximum overload 27,400 pounds

■—Overload range 2,640 miles

§—Equipped for bombing

▾—Overload 82,000 pounds

(1)—Carrying a 1,760 lb. torpedo

(2)—With bomb load of 2 tons

(a)—With 5,750 pounds of bombs

Can—Cannon

Comm—Communications

f—Fixed

f-a—Firing aft

f-f—Firing forward

fpm—Feet per minute

fsg—Forward fuselage

g—Guns

h-o—Hand operated

(IL)—In line

kg—Kilogram

m—Movable

mc.g—Machine gun

mph—Miles per hour

pass.—Passengers

p-o-t—Power operated turret

Rad—Radial

Recon—Reconnaissance

sh.g—Shell gun

sg—Single gun

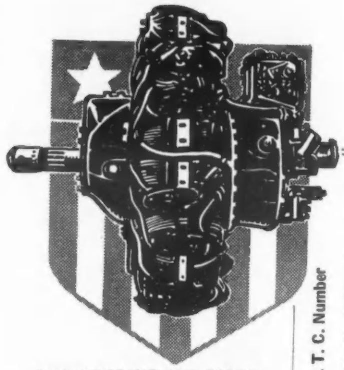
SL—Sea level

smc.g—Sub-machine gun

tg—Tommy-gun

tor—Torpedoes

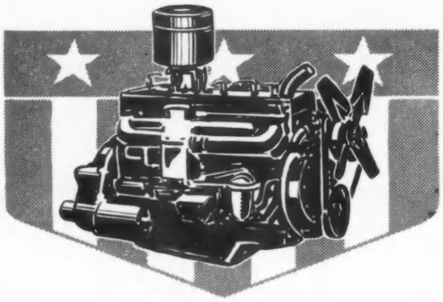
AMERICAN AIRCRAFT ENGINES



Engine Make and Model	A. T. C. Number	Arrangement	Cooling Medium	Number of Cylinders–Bore and Stroke (In.)	Total Piston Displacement (Cu. In.)	Compression Ratio (to 1)	B.M.E.P. at Cruising Hp. (Lb. per Sq. In.)	Blower Ratio	Cylinder Material	No. of Valves per Cylinder: Intake	No. of Valves per Cylinder: Exhaust	Valve Arrangement	Maximum (Except Take-off): Horsepower	Maximum: R. P. M.	Maximum: At Sea Level or Altitude (Ft.)	Take-off: Horsepower	Take-off: R. P. M.	Cruising: Horsepower	Cruising: R. P. M.	Octane Rating of Fuel Required	Propeller Drive	Weight (Lb.): Engine—Dry Without Hub or Starter	Weight (Lb.): Per Cruising Hp.	Carburetor—Number and Make Fitted	Ignition System: Make	Ignition System: Current Source	Ignition System: Number	Starting: Make	Starting: Method	Installation Dimensions Overall—Ins.: Length	Height or O. D.	Width	Height Above Engine Bed (In.)	Diam. Mount., Ring or Distance Between Bearers
Allison F4R		V60	Lig	12-5½x6	1710.0	6.65	152	8.80	6	2	2	OH	1000	2600	10800	1325	3000	750	2280	100	G	1345	1.79	1-Str	Scin	Mag	1	Ecl	EM	85⅞	36¾	29 9/32	23 9/32	18⅜
Allison F5R, F5L		V60	Lig	12-5½x6	1710.0	6.65	152	7.48	6	2	2	OH	1000	2600	††	1325	3000	750	2280	100	G	1345	1.79	1-Str	Scin	Mag	1	Ecl	EM	85⅝	36 17/32	29 9/32	23 9/32	18⅜
Allison F10R, F10L		V60	Lig	12-5½x6	1710.0	6.65	167	7.48	6	2	2	OH	1100	2600	††	1325	3000	825	2280	100	G	1345	1.63	1-Str	Scin	Mag	1	Ecl	EM	85⅝	36¾	29 9/32	23 9/32	18⅜
Allison F20R		V60	Lig	12-5½x6	1710.0	6.65	152	9.60	6	2	2	OH	1000	2600	14000	1200	3000	750	2280	100	G	1352	1.80	1-Str	Scin	Mag	1	Ecl	EM	85⅞	36¾	29 9/32	23 9/32	18⅜
Allison F21R		V60	Lig	12-5½x6	1710.0	6.65	167	7.48	6	2	2	OH	1100	2600	3000	1325	3000	825	2280	100	G	1353	1.64	1-Str	Scin	Mag	1	Ecl	EM	85⅞	36 21/32	29 9/32	23 9/32	18⅜
Allison E6		V60	Lig	12-5½x6	1710.0	6.65	152	8.80	6	2	2	OH	1000	2600	10800	1325	3000	750	2280	100	G	1435	1.91	1-Str	Scin	Mag	1	Ecl	EM	194	37 9/16	29 9/32	23 9/32	18⅜
Allison E18		V60	Lig	12-5½x6	1710.0	6.65	152	9.60	6	2	2	OH	1000	2600	14000	1200	3000	750	2280	100	G	1435	1.91	1-Str	Scin	Mag	1	Ecl	EM	194	37 9/16	29 9/32	23 9/32	18⅜
Allison E19		V60	Lig	12-5½x6	1710.0	6.65	152	9.60	6	2	2	OH	1000	2600	14000	1200	3000	750	2280	100	G	1435	1.91	1-Str	Scin	Mag	1	Ecl	EM	194	37 9/16	29 9/32	23 9/32	18⅜
Continental Series 7-A-50	190	Hor	Air	4-3⅞x3⅝	171.0	5.40	108	No	5	1	1	I	50	1900	SL	50	1900	42	1800	65	D	161	3.83	1-Str°	Scin	Mag	1			30 13/32	22 9/16	31 11/16		
Continental Series 8-A-50	190	Hor	Air	4-3⅞x3⅝	171.0	5.40	108	No	5	1	1	I	50	1900	SL	50	1900	42	1800	65	D	170	4.05	1-Str°	Scin	Mag	2			30 21/32	22 9/16	31 11/16		
Continental Series 9-A-50	190	Hor	Air	4-3⅞x3⅝	171.0	5.40	108	No	5	1	1	I	50	1900	SL	50	1900	42	1800	65	D	176	4.19	1-Str°	Scin	Mag	2	Ecl*	EM	32 11/32	22 9/16	31 11/16		
Continental Series 7-A-65	205	Hor	Air	4-3⅞x3⅝	171.0	6.30	114	No	5	1	1	I	65	2300	SL	65	2300	53	2150	73	D	161	3.04	1-Str°	Scin	Mag	1			30 13/32	22 9/16	31 11/16		
Continental Series 8-A-65	205	Hor	Air	4-3⅞x3⅝	171.0	6.30	114	No	5	1	1	I	65	2300	SL	65	2300	53	2150	73	D	170	3.21	1-Str°	Scin	Mag	2			30 21/32	22 9/16	31 11/16		
Continental Series 9-A-65	205	Hor	Air	4-3⅞x3⅝	171.0	6.30	114	No	5	1	1	I	65	2300	SL	65	2300	53	2150	73	D	176	3.32	1-Str°	Scin	Mag	2	Ecl*	EM	32 11/32	22 9/16	31 11/16		
Continental Series 8-A-75	213	Hor	Air	4-3⅞x3⅝	171.0	6.30	119	No	5	1	1	I	75	2600	SL	75	2600	63	2450	73	D	170	2.70	1-Str°	Scin	Mag	2			30 21/32	22 9/16	31 11/16		
Continental Series 9-A-75	213	Hor	Air	4-3⅞x3⅝	171.0	6.30	119	No	5	1	1	I	75	2600	SL	75	2600	63	2450	73	D	176	2.79	1-Str°	Scin	Mag	2	Ecl*	EM	32 11/32	22 9/16	31 11/16		
Continental Series 8-A-80	217	Hor	Air	4-3⅞x3⅝	171.0	7.50	117	No	5	1	1	I	80	2700	SL	80	2700	63	2500	80	D	170	2.70	1-Str°	Scin	Mag	2			30 21/32	22 9/16	31 11/16		
Continental Series 9-A-80	217	Hor	Air	4-3⅞x3⅝	171.0	7.50	117	No	5	1	1	I	80	2700	SL	80	2700	63	2500	80	D	176	2.79	1-Str°	Scin	Meg	2	Ecl*	EM	32 21/32	22 9/16	31 11/16		
Continental Series 6A-W670	162	Rad	Air	7-5⅛x4⅝	668.0	5.40	106	No	5	1	1	I	220	2075	SL	220	2075	169	1900	65	D	480	2.84	1-Str°	Scin	Mag (a)	2	Ecl*	EM	34 3/16	42¼			20
Continental Series K-W670	162	Rad	Air	7-5⅛x4⅝	668.0	5.40	109	No	5	1	1	I	225	2175	SL	225	2175	189	2050	65	D	480	2.54	1-Str°	Scin	Mag (a)	2	Ecl*	EM	34 3/16	42¼			20
Continental Series M-W670	162	Rad	Air	7-5⅛x4⅝	668.0	6.10	116	No	5	1	1	I	240	2200	SL	240	2200	202	2075	80	D	490	2.43	1-Str°	Scin	Mag (a)	2	Ecl*	EM	34 3/16	42¼			20
Franklin (1) 4AC176-BA2	221	Hor	Air	4-4x3½	176.0	6.00	104	No.	4	1	1	I	65	2300	SL	65	2300	48¾	2100	73	D	182	3.74	1-MS	Eis	Mag	2		PS	28⅝	19 31/32	30¼	8 9/16	
Franklin 4AC199-D3	226	Hor	Air	4-4¼x3½	199.0	6.30	110	No	4	1	1	I	85	2500	SL	85	2500	63¾	2300	73	D	209	3.28	1-MS	Eis	Mag	2	Au	EM	30 11/16	24 9/16	30¼	13⅛	
Franklin 4AC199-E3	226	Hor	Air	4-4¼x3½	199.0	7.00	117	No	4	1	1	I	90	2500	SL	90	2500	67½	2300	80	D	209	3.10	1-MS	Eis	Mag	2	Au	EM	30 11/16	24 9/16	30¼	13⅛	
Franklin 6AC298-F3	225	Hor	Air	6-4¼x3½	298.0	7.00	113	No	4	1	1	I	130	2550	SL	130	2550	97½	2300	80	D	280	2.87	1-MS	Eis	Mag	2	Au	EM	24 9/16	30¼	13⅛		
Franklin 4AC-199-B2	226	H	Air	4-4¼x3½	199.0	6.00	133‡	No	4	1	1	I	65	1950	SL	65	1950			73	D	189	2.90‡	1-MS	Eis	Mag	2		PS	28⅝	19 31/32	30¼	8 9/16	10⅝ (k)
Franklin 4AC-199-B3	226	H	Air	4-4¼x3½	199.0	6.00	133‡	No	4	1	1	I	65	1950	SL	65	1950			73	D	208	3.20‡	1-MS	Eis	Mag	2	Au	EM	30 11/16	24 9/16	30¼	13⅛	10⅝ (k)
Franklin 4AC-199-E4	226	H	Air	4-4¼x3½	199.0	7.00	143‡	No	4	1	1	I	90	2500	SL	90	2500			80	D	228	2.54‡	1-MS	Eis	Mag	2	Au	EM	30 11/16	24 9/16	30¼	13⅛	10⅝ (k)
Franklin 4ACG-199-H3	226	H	Air	4-4¼x3½	199.0	7.00	128‡	No	4	1	1	I	113	3500	SL	113	3500			80	G	236	2.09‡	1-MS	Eis	Mag	2	Au	EM	36¼	25 5/16	30¼	13⅛	10⅝ (k)
Franklin 6ACT-298-J4	225	H	Air	6-4¼x3½	298.0	8.40	141‡	No	4	1	1	I	155	2930	SL	155	2930			100	D	330	2.13‡	2-MS	Scin	Mag	2	DR	EM	40¼	19⅝	30¼	13⅛	10⅝ (n)
Franklin 6ACG-298-H3	Pen	H	Air	6-4¼x3½	298.0	7.00	125‡	No	4	1	1	I	165	3500	SL	165	3500			80	G	329	1.99‡	2-MS	Scin	Mag	2	DR	EM	43 11/16	24 9/16	30¼	13⅛	10⅝ (n)
Jacobs L-4M	121	Rad	Air	7-5¼x5	757.0	5.38	88	No	5	1	1	I	225	2000	SL	245	2200	160	1900	73	D	497	3.10	1-Str	Scin	Mag	2	Ecl	EM	37 15/32	43½			16½
Jacobs L-4MB	121	Rad	Air	7-5¼x5	757.0	5.38	88	No	5	1	1	I	225	2000	SL	245	2200	160	1900	73	D	495	3.09	1-Str	Scin	B.M.	(b)	Ecl	EM	37 15/32	43½			16½
Jacobs R-755-9, L4MBB	121	Rad	Air	7-5¼x5	757.0	5.40	88	No	5	1	1	I	225	2000	SL	245	2200	160	1900	73	D	513	3.21	1-Str	Scin	B.M.	(b)	Ecl	EM	39½	37 7/32			16½
Jacobs R-755-5, L4MA7	121	Rad	Air	7-5¼x5	757.0	5.38	88	No	5	1	1	I	225	2000	SL	245	2200	160	1900	73	D	500	3.12	1-Str	Scin	Mag	2	Ecl	EM	37 7/32	43½			16½
Jacobs L-6M	195	Rad	Air	7-5½x5½	914.0	6.00	96	No	5	1	1	I	300	2100	3700	330	2200	210	1900	80	D	557	2.65	1-Str	Scin	Mag	2	Ecl	EM	37 15/32	45⅝			16½
Jacobs R-915-5, R-915-7, L-6MB	195	Rad	Air	7-5½x5½	914.0	6.00	96	No	5	1	1	I	300	2100	SL	330	2200	210	1900	80	D	555	2.64	1-Str	Scin	B.M.	(b)	Ecl	EM	40⅛	45⅝			16½
Jacobs R-915-3, L-6MBA	195	Rad	Air	7-5½x5½	914.0	6.30	96	No	5	1	1	I	300	2100	SL	330	2200	210	1900	80	D	570	2.71	1-Str	Scin	B.M.	(b)	Ecl	EM	40 7/32	45⅝			16½
Ken-Royce 5G	46	Rad	Air	5-4¼x3¾	266.0	6.00	119‡	No	8	1	1	I	90	2250	SL					73	D	226	2.51‡	1-Hol	BS	Mag	2		PS	23¾	33¼			17⅞
Ken-Royce 7G	52	Rad	Air	7-4¼x3¾	372.0	6.00	115‡	No	8	1	1	I	120	2225	SL					73	D	300	2.50‡	1-Hol	Scin	Mag	2		PS	24½	33¼			17⅞
Kinner K-5-2	3	Rad	Air	5-4¼x5¼	372.0	5.10	99	No	8	1	1	I	100	1810	SL	100	1810	75	1610	73	D	304	4.05	1-SH	BS	Mag	2	Ecl	PE	32 5/16	45⅜			14
Kinner B-5-2, B-5-4	51	Rad	Air	5-4⅝x5¼	441.0	5.25	94	No	5	1	1	I	125	1925	SL	125	1925	90	1725	73	D	312	3.47	1-SH	BS	Mag	2	Ecl	PE	33⅝	45⅜			14
Kinner R-5-2	153	Rad	Air	5-5x5½	540.0	5.50	102	No	5	1	1	I	160	1850	SL	160	1850	115	1650	73	D	335	2.91	1-SH	BS	Mag	2	Ecl	PE	33 1/32	45⅝			14
Kinner R-55	153	Rad	Air	5-5x5½	540.0	5.50	102	No	5	1	1	I	160	1850	SL	160	1850	115	1650	73	D	345	3.00	1-SH	BS	Mag	2	Ecl	PE	33 19/32	45⅝			14
Kinner R-53	153	Rad	Air	5-5x5½	540.0	6.00	100	No	5	1	1	I	175	2100	SL	175	2100	130	1900	73	D	351	2.70	1-SH	BS	Mag	2	Ecl	PE	33 19/32	45⅝			14
Kinner C-7	122	Rad	Air	7-5⅝x6	1044.0	5.25	100	No	5	1	1	I	300	1800	SL	300	1800	210	1600	73	D	600	2.86	1-Str	BS	Mag	2	Ecl	PE	44⅛	47¾			20
Kinner SC-7	175	Rad	Air	7-5⅝x6	1044.0	5.50	107	9.71	5	1	1	I	350	1900	5000	350	1900	240	1700	73	D	650	2.71	1-Str	BS	Mag	2	Ecl	PE	45 13/32	47¾			20
Lycoming (3) O-145A2	199	Hor	Air	4-3⅝x3½	144.5	5.65	110	No	4	1	1	I	55	2300	SL	55	2300	42	2100	73	D	163	3.88	1-SM	SES	Mag	2			24⅝	20 19/32	29 9/16		10¼
Lycoming O-145A3	199	Hor	Air	4-3⅝x3½	144.5	5.65	110	No	4	1	1	I	55	2300	SL	55	2300	42	2100	73	D	165	3.94	1-SM	SES	Mag	2	Ecl	EM	24⅝	22 19/32	29 9/16		10¼
Lycoming O-145A4	199	Hor	Air	4-3⅝x3½	144.5	5.65	110	No	4	1	1	I	55	2300	SL	55	2300	42	2100	73	D	174	4.15	1-SM	SES	Mag	2	DR	EM	26	23	29 9/16		
Lycoming O-145B2	210	Hor	Air	4-3⅝x3½	144.5	6.50	112	No	4	1	1	I	65	2550	SL	65	2550	47	2300	73	D	163	3.48	1-SM	SES	Mag	2			24⅝	20 19/32	29 9/16		10¼
Lycoming O-145B3	210	Hor	Air	4-3⅝x3½	144.5	6.50	112	No	4	1	1	I	65	2550	SL	65	2550	47	2300	73	D	166	3.52	1-SM	SES	Mag	2	Ecl	EM	24⅝	22 19/32	29 9/16		10¼
Lycoming O-145B4	210	Hor	Air	4-3⅝x3½	144.5	6.50	112	No	4	1	1	I	65	2550	SL	65	2550	47	2300	73	D	175	3.73	1-SM	SES	Mag	2	DR	EM	26	23	29 9/16		
Lycoming O-145C2	210	Hor	Air	4-3⅝x3½	144.5	6.50	108	No	4	1	1	I	75	3100	SL	75	3100	55	2800	73	D	163	2.97	1-SM	SES	Mag	2			29.31	20 19/32	29 9/16		10¼
Lycoming O-145C3	210	Hor	Air	4-3⅝x3½	144.5	6.50	108	No	4	1	1	I	75	3100	SL	75	3100	55	2800	73	D	166	3.02	1-SM	SES	Mag	2	Ecl	EM	24⅝	22 19/32	29 9/16		10¼
Lycoming O-145C4	210	Hor	Air	4-3⅝x3½	144.5	6.50	108	No	4	1	1	I	75	3100	SL	75	3100	55	2800	73	D	175	3.18	1-SM	SES	Mag	2	DR	EM	26	23	29 9/16		
Lycoming GO-145C2	210	Hor	Air	4-3⅝x3½	144.5	6.50	106	No	4	1	1	I	75	3200	SL	75	3200	56	2900	73	D	196	3.51	1-SM	SES	Mag	2			24⅝	20 19/32	29 9/16		10¼
Lycoming GO-145C3	210	Hor	Air	4-3⅝x3½	144.5	6.50	106	No	4	1	1	I	75	3200	SL	75	3200	56	2900	73	D	199	3.55	1-SM	SES	Mag	2	Ecl	EM	29 5/16	22 21/64	29 9/16		10¼
Lycoming GO-145C4	210	Hor	Air	4-3⅝x3½	144.5	6.50	106	No	4	1	1	I	75	3200	SL	75	3200	56	2900	73	G	208	3.72	1-SM	SES	Mag	2	DR	EM	30 11/16	23	29 9/16		

Lycoming	R680-D5	172	Rad	Air	9-4⅝x4½	680.4	5.50	122	1.00	5	1	1	I	245	2100	SL	260	2300	210	2000	80	D	505	2.40	1-Str	Scin	Mag	1	Ecl	EM	37 3/64				19¼
Lycoming	R680-D6	173	Rad	Air	9-4⅝x4½	680.4	5.50	113	1.00	5	1	1	I	225	2100	SL	245	2300	195	2000	73	D	505	2.59	1-Str	Scin	Mag	1	Ecl	EM	37 3/64				19¼
Lycoming	R680-E1	202	Rad	Air	9-4⅝x4½	680.4	6.20	122	1.00	5	1	1	I	275	2200	SL	290	2300	210	2000	80	D	514	2.45	1-Str	Scin	Mag	1	Ecl	EM	37 3/64				19¼
Lycoming	R680-E2	202	Rad	Air	9-4⅝x4½	680.4	5.50	116	1.00	5	1	1	I	265	2200	SL	280	2300	200	2000	73	D	514	2.57	1-Str	Scin	Mag	1	Ecl	EM	37 3/64				19¼
Lycoming	R680-E3	202	Rad	Air	9-4⅝x4½	680.4	7.00	125	1.00	5	1	1	I	285	2200	SL	300	2300	215	2000	87	D	514	2.39	1-Str	Scin	Mag	1	Ecl	EM	37½				19¼
Lycoming	R680-E3A	202	Rad	Air	9-4⅝x4½	680.4	7.00	125	1.00	5	1	1	I	285	2200	SL	300	2300	215	2000	87	D	515	2.40	1-Str	Scin	Mag	1	Ecl	EM	37½				19¼
Lycoming	O-235	223	Hor	Air	4-4⅜x3⅞	233.3	6.25	111	No	5	1	1	I	100	2550	SL			75	2300	73	D	235	3.13	1-MS	Scin	Mag	2	Ecl	EM	30.09	25.19	32.32		
Lycoming	O-235A	223	Hor	Air	4-4⅜x3⅞	233.3	6.25	111	No	5	1	1	I	100	2550	SL			75	2300	73	D	242	3.23	1-MS	Scin	Mag	2	DR	EM	31.54	25.20	32.32		
Lycoming	O-290	229	Hor	Air	4-4⅞x3⅞	289.0	6.25	112	No	5	1	1	I	125	2450	SL			94	2250	73	D	244	2.60	1-MS	Scin	Mag	2	Ecl	EM	30.09	25.47	32.32		
Lycoming	O-290A	229	Hor	Ar	4-4⅞x3⅞	289.0	6.25	112	No	5	1	1	I	125	2450	SL	125	2550	94	2250	73	D	251	2.67	1-MS	Scin	Mag	2	DR	EM	31.54	25.48	32.32		
Lycoming	O-350	227	Hor	Air	6-4⅜x3⅞	349.5	6.25	113	No	5	1	1	I	150	2500	SL	150	2500	113	2270	73	D	341	3.02	1-MS	Scin	Mag	2	Ecl	EM	45.48	28.04	32.32		
Lycoming	O-350A	227	Hor	Air	6-4⅜x3⅞	349.5	6.25	113	No	5	1	1	I	150	2500	SL	150	2500	113	2270	73	D	347	3.07	1-MS	Scin	Mag	2	DR	EM	46.47	26.54	32.32		
Lycoming	O-435	228	Hor	Air	6-4⅞x3⅞	434.0	6.25	114	No	5	1	1	I	175	2300	SL			131	2100	73	D	347	2.65	1-MS	Scin	Mag	2	Ecl	EM	46.47	26.54	32.32		
Lycoming	O-435A	228	Hor	Air	6-4⅞x3⅞	434.0	6.25	114	No	5	1	1	I	175	2300	SL	175	2300	131	2100	73	D	353	2.69	1-MS	Scin	Mag	2	DR	EM	45.48	28.04	32.32		
Lycoming	O-435-B		H	Air	6-4⅞x3⅞	434.0	7.50	113	No	8	1	1	I	225	3000	SL			168	2720	100	D	373	2.22	1-MS	Scin	Mag	2	Ecl	EM	45.11	29.61	32.32		
Lycoming	O-435-C	228	H	Air	6-4⅞x3⅞	434.0	6.50	109	No	8	1	1	I	185	2450	SL			139	2325	73	D	350	2.52	1-MS	Scin	Mag	2	Ecl	EM	45.48	28.04	32.32		
Lycoming	O-290-B	229	H	Air	4-4⅞x3⅞	289.0	6.50	109	No	8	1	1	I	125	2600	SL	130	2800	94	2350	73	D	244	2.60	1-MS	Scin	Mag	2			30.09	26.64	32.32		
Lycoming	O-290-C	229	H	Air	4-4⅞x3⅞	289.0	6.50	109	No	8	1	1	I	125	2600	SL	130	2800	94	2350	73	D	235	2.50	1-MS	Scin	Mag	2			30.09	26.64	32.32		
Menasco-Super Pirate	D4	67	IV-L	Air	4-4¾x5⅛	363.0	5.50	98	No	5	1	1	I	125	2175	SL	125	2175	87	1930	73	D	300	3.45	1-Str	Eis	Mag	2	Ecl	HE	48 7/16	29¼	19 13/16	9 13/32	16⅝
Menasco-Super Pirate	D4-87	67	IV-L	Air	4-4¾x5⅛	363.0	6.00	98	No	5	1	1	I	125	2175	SL	134	2260	87	1930	80	D	310	3.56	1-Str	Eis	Mag	2	Ecl	HE	48 7/16	29¼	19 13/16	9 13/32	16⅝
Menasco-Pirate	C4S	134	IV-L	Air	4-4¾x5⅛	363.0	5.50	114	9.60	5	1	1	I	150	2260	3000	158	2260	105	2010	80	D	320	3.04	1-Str	Eis	Mag	2	Ecl	HE	49 11/16	28 9/16	19 7/16	9 13/32	16⅝
Menasco-Super Bucaneer	C6S4	197	IV-L	Air	6-4¾x5⅛	544.0	5.50	130	10.90	5	1	1	I	260	2300	7500	290	2400	182	2040	87	D	550	3.02	1-Str	BS	Mag	2	Ecl	EM	74¾	39 19/32	17¼	8 23/32	13½
Pratt & Whitney-Wasp, Jr.	T1B3	123	Rad	Air	9-5 3/16x5 3/16	985.0	6.10	120	10.0	8	1	1	I	450	2300	SL	450	2300	300	2000	91	D	669	2.23	1-Str	Bos	Mag	2	Opt	Opt	42.44	46.13			
Pratt & Whitney-Wash. Jr.	SB3	123	Rad	Air	9-5 3/16x5 3/16	985.0	6.10	120	10.0	8	1	1	I	400	2200	5000	450	2300	300	2000	91	D	669	2.23	1-Str	Scin	Mag	2	Opt	Opt	42.44	46.13			
Pratt & Whitney-Wasp	S3H1	143	Rad	Air	9-5¾x5¾	1344.0	6.10	118	10.0	8	1	1	I	550	2200	5000	600	2250	400	2000	91	D	864	2.16	1-Str	Scin	Mag	2	Opt	Opt	43.00	51.81			
Pratt & Whitney-Wash	S1H1	129	Rad	Air	9-5¾x5¾	1344.0	6.10	118	12.0	8	1	1	I	550	2200	8000	600	2250	400	2000	91	D	864	2.16	1-Str	Scin	Mag	2	Opt	Opt	43.00	51.81			
Pratt & Whitney-Wash	S3H1-G	142	Rad	Air	9-5¾x5¾	1344.0	6.10	118	10.0	8	1	1	I	550	2200	5000	600	2250	400	2000	91	G	946	2.36	1-Str	Scin	Mag	2	Opt	Opt	47.8	51.81			
Pratt & Whitney-Wash	S1H1-G	129	Rad	Air	9-5¾x5¾	1344.0	6.10	118	12.0	8	1	1	I	550	2200	8000	600	2250	400	2000	91	G	946	2.36	1-Str	Scin	Mag	2	Opt	Opt	47.8	51.81			
Pratt & Whitney-Twin Wasp	S1C3-G	186	Rad	Air	14-5½x5½	1830.0	6.70	130	7.15	8	1	1	I	1050	2550	7500	1200	2700	700	2325	100	G	1465	2.10	1-Str	Bos	Mag	2	Opt	Opt	60.6	48.19			
Pratt & Whitney-Twin Wasp	S1C3-G	186	Rad	Air	14-5½x5½	1830.0	6.70	130	7.15	8	1	1	I	1050	2550	7500	1200	2700	700	2325	91	G	1438	2.05	1-Str	Scin	Mag	2	Opt	Opt	61.15	48.19			
Pratt & Whitney-Twin Wash	S3C4G	Mil.	Rad	Air	14-5½x5½	1830.0	6.70	130	7.15	8	1	1	I	L1100	2550	6100	1200	2700	700	2250	100	G	1490	3.22	1-Str	Scin	Mag	2	Opt	Opt	63.5	48.19			
		(2-	Speed	Blo	wer Engine)				8.47					H1000	2550	12500					91														
Pratt & Whitney-Twin Wasp	S3C4G	186	Rad	Air	14-5½x5½	1830.0	6.70	130	7.15	8	1	1	I	L1100	2550	6200	1200	2700	700	2250	100	G	1460	2.09	1-Str	Scin	Mag	2	Opt	Opt	62.9				
		(2-	Speed	Blo	wer Engine)				8.47					H1000	2550	12500																			
Pratt & Whitney-Twin Wasp	S4C4G	186	Rad	Air	14-5½x5½	1830.0	6.70	130	7.15	8	1	1	I	L1050	2550	7500	1200	2700	L700	2250	91	G	1495	2.14	1-Str	Scin	Mag	2	Opt	Opt	63.5	48.19			
		(2-	Speed	Blo	wer Engine)				8.47					H900	2550	15400			H650	2250															
Pratt & Whitney-Twin Wasp	S4C4G	186	Rad	Air	14-5½x5½	1830.0	6.70	130	7.15	8	1	1	I	L1050	2550	7500	1200	2700	L700	2250	91	G	1460	2.09	1-Str	Scin	Mag	2	Opt	Opt	62.9	48.19			
		(2-	Speed	Blo	wer Engine)				8.47					H900	2550	15400			H650	2250															
Ranger	6-440C-2	216	IV-L	Air	6-4⅛x5½	441.0	6.00	102	No	5	1	1	OH	175	2450	SL	175	2450	130	2300	65	D	376	2.90	1-Str	Scin	Mag	2	Opt	Opt	52 29/32	30 31/32	20 5/32	11¼	
Ranger	6-440C-3	216	IV-L	Air	6-4⅛x5½	441.0	6.20	105	No	5	1	1	OH	180	2450	SL	180	2450	135	2300	73	D	376	2.79	1-Str	Scin	Mag	2	Opt	Opt	52 29/32	30 31/32	20 5/32	11¼	
Ranger	6-440C-4	216	IV-L	Air	6-4⅛x5½	441.0	6.80	113	No	5	1	1	OH	190	2450	SL	190	2450	145	2300	80	D	376	2.60	1-SM	Scin	Mag	2	Opt	Opt	52 29/32	30 31/32	20 5/32	11¼	
Ranger	6-440C-5	216	IV-L	Air	6-4⅛x5½	441.0	7.50	177	No	5	1	1	OH	200	2450	SL	200	2450	150	2300	87	D	376	2.51	1-Str	Scin	Mag	2	Opt	Opt	52 29/32	30 31/32	20 5/32	11¼	
Warner-Scarab	70A	2	Rad	Air	7-4¼x4¼	422.0	5.20	114‡	No	5	1	1	I	125	2050	SL	125	2050	(e)		73	D	292	2.34‡	1-SH	Scin	Mag	2	Ecl	EM	13	36 9/16			17
Warner-Super Scarab	50	104	Rad	Air	7-4⅝x4¼	499.0	5.30	113‡	No	5	1	1	I	145	2050	SL	145	2050	(e)		73	D	306	2.11‡	1-SH	Scin	Mag	2	Ecl	EM	13	36 9/16			17
Warner-Super Scarab	165	214	Rad	Air	7-4⅝x4¼	499.0	6.40	125‡	No	5	1	1	I	165	2100	SL	175	2250	(e)		73	D	338	1.93‡	1-SH	Scin	Mag	2	Ecl	EM	14	37¼			17½
Wright	Cyclone 579C14AC1	176	Rad	Air	14-6⅛x6 5/16	2603.0	6.85	144	7.00	5	1	1	I	1350	2300	6200	1600	2400	900	1900	100	G	1935	2.15	1-SH	Scin	Mag	2	Opt	Opt	62.06	55	55		25
Wright	Cyclone GR-2600-A2B	176	Rad	Air	14-6⅛x6 5/16	2603.0	6.85	144	7.00	5	1	1	I	1350	2300	5800	1600	2400	900	1900	91	G	1935	2.15	1-SH	Scin	Mag	2	Opt	Opt	62.06	55	55		25
Wright	Cyclone GR-2600-A5A		Rad	Air	14-6⅛x6 5/16	2603.0	6.85	144	7.14	5	1	1	I	L1350	2300	5000	1600	2400	900	1900	100	G	1950	2.17	1-SH	Scin	Mag	2	Opt	Opt	62.06	55	55		25
									10.0					H1275	2300	12000																			
		(2-	Speed	Blo	wer Engine)																														
Wright	Cyclone GR-2600-A5B		Rad	Air	14-6⅛x6 5/16	2603.0	6.30	144	7.14	5	1	1	I	L1350	2300	5000	1600	2400	900	1900	91	G	1950	2.17	1-SH	Scin	Mag	2	Opt	Opt	62.06	55	55		25
		(2-	Speed											H1275	2300	11500																			
Wright	Cyclone 702C9GC	219	Rad	Air	9-6⅛x6⅞	1823.0	6.70	141	7.00	5	1	1	I	1000	2300	6900	1200	2500	650	2000	91	G	1310	1.98	1-SH	Scin	Mag	2	Opt	Opt	50.04	55⅛			23⅜
Wright	Cyclone GR-1820-G203A		Rad	Air	9-6⅛x6⅞	1823.0	6.70	141	8.30	5	1	1	I	950	2300	9100	1100	2500	650	2000	91	G	1310	2.01	1-SH	Scin	Mag	2	Opt	Opt	50.04	55⅛			23⅜
Wright	Cyclone 704C9GC	219	Rad	Air	9-6⅛x6⅞	1823.0	6.70	141	7.14	5	1	1	I	L1000	2300	6900	1200	2500	650	2000	91	G	1320	2.00	1-SH	Scin	Mag	2	Opt	Opt	50.04	55⅛			23⅜
	–	(2-	Speed	Blo	wer Engine				10.0					H900	2300	15200																			
Wright	Cyclone GR-1820-G102A	169	Rad	Air	9-6⅛x6⅞	1823.0	6.30	143	7.00	5	1	1	I	900	2300	6700	1100	2350	625	1900	91	G	1275	2.02	1-SH	Scin	Mag	2	Opt	Opt	48.12	55 7/64			23⅜
Wright	Cyclone GR-1820-G103A	180	Rad	Air	9-6⅛x6⅞	1823.0	6.30	143	8.31	5	1	1	I	860	2300	11100	1000	2350	625	1900	91	G	1275	2.02	1-SH	Scin	Mag	2	Opt	Opt	48.12	55 7/64			23⅜
Wright	Cyclone GR-1820-G105A	192	Rad	Air	9-6⅛x6⅞	1823.0	6.30	143	(g)	5	1	1	I	900	2300	6700	1100	2350	625	1900	91	G	1287	2.04	1-SH	Scin	Mag	2	Opt	Opt	48.12	55 7/64			23⅜
Wright	■Cyclone R-1820-G2	157	Rad	Air	9-6⅛x6⅞	1823.0	6.45	137	7.00	5	1	1	I	850	2100	5800	1000	2200	600	1900	91	D	1103	1.84	1-SH	Scin	Mag	2	Opt	Opt	43¼	54¼			23⅜
Wright	■Cyclone R-1820-G3	171	Rad	Air	9-6⅛x6⅞	1823.0	6.45	137	8.31	5	1	1	I	840	2100	8700	875	2200	600	1900	91	D	1103	1.84	1-SH	Scin	Mag	2	Opt	Opt	43¼	54¼			23⅜
Wright	■Cyclone R-1820-G3B	171	Rad	Air	9-6⅛x6⅞	1823.0	6.20	137	8.31	5	1	1	I	820	2100	8800	900	2350	600	1900	91	D	1103	1.84	1-SH	Scin	Mag	2	Opt	Opt	43¼	54¼			23⅜
Wright	■Cyclone R-1820-G5	154	Rad	Air	9-6⅛x6⅞	1823.0	6.45	137	(g)	5	1	1	I	850	2100	6000	1000	2200	600	1900	91	D	1115	1.86	1-SH	Scin	Mag	2	Opt	Opt	43¼	54¼			23⅜
Wright	♠■Cyclone R-1820-F52	148	Rad	Air	9-6⅛x6⅞	1823.0	6.40	126	7.00	5	1	1	I	775	2100	5800	890	2200	550	1900	91	D	1000	1.82	1-SH	Scin	Mag	2	Opt	Opt	43.38	54 3/32			23⅜
Wright	■Cyclone R-1820-F53	149	Rad	Air	9-6⅛x6⅞	1823.0	6.40	126	8.31	5	1	1	I	745	2100	9600	785	2200	550	1900	91	D	1000	1.82	1-SH	Scin	Mag	2	Opt	Opt	43.38	54 3/32			23⅜
Wright	■Cyclone R-1820-F55	198	Rad	Air	9-6⅛x6⅞	1823.0	6.40	126	(g)	5	1	1	I	760	2100	5800	875	2200	550	1900	91	D	1012	1.84	1-SH	Scin	Mag	2	Opt	Opt	43.38	54 3/32			23⅜
Wright	■Cyclone R-1820-F56	159	Rad	Air	9-6⅛x6⅞	1823.0	6.40	126	8.83	5	1	1	I	755	2100	11300	785	2200	550	1900	91	D	1000	1.82	1-SH	Scin	Mag	2	Opt	Opt	43.38	54 3/32			23⅜
Wright	♠■Cyclone R-1820-F62	148	Rad	Air	9-6⅛x6⅞	1823.0	6.40	126	7.00	5	1	1	I	760	2100	5800	900	2350	550	1900	91	D	1000	1.82	1-SH	Scin	Mag	2	Opt	Opt	43.38	54 3/32			23⅜
Wright	■Cyclone R-1820-F65	198	Rad	Air	9-6⅛x6⅞	1823.0	6.40	126	(g)	5	1	1	I	760	2100	5800	900	2350	550	1900	91	D	1012	1.82	1-SH	Scin	Mag	2	Opt	Opt	43.38	53 3/32			23⅜
Wright	Whirlwind R-975-E1	87	Rad	Air	9-5x5½	973.0	6.10	121	7.80	5	1	1	I	365	2100	SL			290	1950	73	D	660	2.28	1-Str	Scin	Mag	2	Opt	Opt	42.44	45			23⅜
Wright	Whirlwind R-975-E3	125	Rad	Air	9-5x5½	973.0	6.30	132	10.15	5	1	1	I	420	2200	1400	450	2250	325	2000	91	D	675	2.08	1-Str	Scin	Mag	2	Opt	Opt	41 13/64	45			23⅜
Wright	Whirlwind R-760-ET	126	Rad	Air	7-5x5½	756.0	6.10	110	No	5	1	1	I	235	2000	SL			195	1850	73	D	540	2.77	1-Str	Scin	Mag	2	Opt	Opt	42 7/16	45			19¼
Wright	Whirlwind R-760-E1	94	Rad	Air	7-5x5½	756.0	6.10	118	7.05	5	1	1	I	285	2100	SL	300	2250	225	2000	73	D	570	2.54	1-Str	Scin	Mag	2	Opt	Opt	42.44	45			19¼
Wright	Whirlwind R-760-E2	155	Rad	Air	7-5x5½	756.0	6.30	118	9.17	5	1	1	I	320	2200	SL	300	2400	225	2000	91	D	570	2.54	1-Str	Scin	Mag	2	Opt	Opt	42.44	45			19¼
Wright	585C14BA	176	Rad	Air	14-6⅛x6 5/16	2603.0	6.90	154	7.03	5	1	1	I	1500	2400	6700	1700	2500	1000	2000	100	G	1965	1.31‡	SH	Scin	Mag	2	Opt		63.40	54¼			25
Wright	586C14BA	176	Rad	Air	14-6⅛x6 5/16	2603.0	6.85	154	7.06	5	1	1	I	L1500	2400	6700	1700	2500	1000	20.0	100	G	1980	1.32‡	SH	Scin	Mag	2	Opt		63.40	54¼			25
		(2-	Speed	Blo	wer Engine)				10.02	5				H1350	2400	15000																			
Wright	GR1820-F56	159	Rad	Air	9-6⅛x6⅞	1823.0	6.40	126	8.83	5	1	1	I	740	2100	11300	770	2200	550	1900	91	G	1095	1.48‡	SC	Scin	Mag	2	Opt		47.81	54.12			23⅜
Wright	728C9GC	219	Rad	Air	9-6⅛x6⅞	1823.0	6.30	141	7.00	5	1	1	I	1000	2300	6000	1200	2500	650	2000	91	G	1310	1.31‡	SH	Scin	Mag	2	Opt		50.04	55⅛			23⅜
Wright	718C9GB1	192	Rad	Air	9-6⅛x6⅞	1823.0	6.30	143	(o)	5	1	1	I	900	2300	6700	1100	2350	625	1900	91	G	1287	1.43‡	SH	Scin	Mag	2	Opt		48.12	55.10			23⅜
Wright	GR1820-F65	198	Rad	Air	9-6⅛x6⅞	1823.0	6.40	126	(g)	5	1	1	I	760	2100	5800	900	2350	550	1900	91	G	1107	1.45‡	SC	Scin	Mag	2	Opt		47.81	54.12	54.12		23⅜
Wright	GR1820-F62	148	Rad	Air	9-6⅛x6⅞	1823.0	6.40	126	7.00	5	1	1	I	760	2100	5800	900	2350	550	1900	91	G	1095	1.44‡	SC	Scin	Mag	2	Opt		47.81	54.12	54.12		23⅜

(For abbreviations see page 120)



AMERICAN

Line Number	Engine Make and Model	Designed for	Number of Cylinders, Bore and Stroke (In.)	Maximum Brake Hp. at Specified R.P.M. — With Bare Engine	Maximum Brake Hp. at Specified R.P.M. — With Standard Accessories	Piston Displacement (Cu. In.)	Compression Ratio	Maximum Torque at R.P.M. (Lb. Ft.) with or without Accessories	Cylinder Liners—Type	Crankcase—Upper Half Integral with Cylinders	Valves — Arrangement	Exhaust Head Material (S.A.E. No.)	Max. Head Diameter (In.) — Intake	Max. Head Diameter (In.) — Exhaust	Min. Port Diameter (In.) — Intake	Min. Port Diameter (In.) — Exhaust	Lift (In.) — Intake	Lift (In.) — Exhaust	Stem Diameter (In.) — Intake	Stem Diameter (In.) — Exhaust
1	Allis-Chalmers B-15	Tr,Ind	4-3¼x3½	24-1800	22-1800	116.2	4.92	74-1100 (EA)	W	In	I	Sil	1.43	1.31	1.20	1.03	.378	.378	.341	.341
2	Allis-Chalmers W-25	Tr,Ind	4-4x4	44-1800	40-1800	201.1	5.00	128-1200 (EA)	W	In	I	Sil	1.68	1.50	1.50	1.32	.376	.378	.372	.372
3	Allis-Chalmers U-40	Tr,Ind	4-4½x5	56-1400	51-1400	318.0	4.75	200-1000 (EA)	W	In	I	Sil	2.03	1.78	1.75	1.50	.375	.375	.372	.372
4	Allis-Chalmers E-60	Tr,Ind	4-5¼x6½	86-1200	78-1200	563.0	5.20	400-700 (EA)	W	In	I	Sil	2.21	2.21	2.00	2.00	.440	.417	.497	.497
5	Allis-Chalmers L-90	Tr,Ind	6-5¼x6½	128-1200	117-1200	844.0	5.20	590-700 (EA)	W	In	I	Sil	2.21	2.21	2.00	2.00	.440	.417	.497	.497
6	Autocar 377	T	6-4x5	119-2800	112-2800	377.0	5.75	280-1400 (BE)	N	Se	L	3140	1.90	1.78	1.68	1.56	.375	.375	.437	.437
7	Autocar 447	T	6-4¼x5¼	133-2500	122-2500	447.0	5.75	351-1100 (BE)	N	Se	L	CNS	2.06	1.93	1.87	1.75	.375	.375	.437	.437
8	Autocar 501	T	6-4½x5¼	145-2500	134-2500	501.0	5.75	395-950 (BE)	N	Se	L	CNS	2.06	1.93	1.87	1.75	.375	.375	.437	.437
9	Brennan Imp. De Luxe	M	4-2x3	20-3900	15-3900	45.0	7.00	31-2500 (EA)	N	Se	I	Sil	1.00	1.00	.875	.875	.250	.250	.312	.312
10	Brennan 20	Ind	4-2¼x3⅛	20-3900	15-3900	50.0	7.40	34-3200 (EA)	N	Se	L	Sil	1.12	1.00	.875	.875	.250	.250	.312	.312
11	Brennan Imp. De Luxe Spec.	M	4-2¼x3⅛	25-4000	20-4000	50.0	7.40	34-3200 (EA)	N	Se	I	Sil	1.12	1.00	.875	.875	.250	.250	.312	.312
12	Brennan M-4	M	4-4x5	45-1800	38-1800	251.0	5.00	155-1000 (EA)	N	Se	L	NCI								
13	Brennan CE	Ind	4-4½x5	54-1600	45-1600	318.0	5.00	203-1000 (EA)	N	Se	L	Sil	2.00	2.00	1.87	1.87	.375	.375	.375	.375
14	Brennan E-4	M	4-4½x5	54-1600	45-1600	318.0	5.00	203-1000 (EA)	N	Se	L	Sil	2.00	2.00	1.87	1.87	.375	.375	.375	.375
15	Brennan B-70	T,B,Tr,Ind	6-4x5½	90-2000	75-2000	415.0	4.50	278-900 (EA)	N	Se	I	Sil	2.12	2.12	2.00	2.00	.375	.375	.437	.437
16	Brennan 100	M	6-4x5½	94-2000	80-2000	415.0	6.00	278-900 (EA)	N	Se	I	Sil	2.12	2.12	2.00	2.00	.375	.375	.437	.437
17	Brennan B-100	T,B,Tr,Ind	6-4⅜x5½	94-2000	80-2000	496.0	4.50	350-1200 (EA)	N	Se	I	Sil	2.12	2.12	2.00	2.00	.375	.375	.437	.437
18	Brennan 125	M	6-4⅜x5½	110-2200	94-2200	496.0	6.00	350-1200 (EA)	N	Se	I	Sil	2.12	2.12	2.00	2.00	.375	.375	.437	.437
19	Brennan 150	M	6-4½x6½	150-2000	130-2000	620.3	6.00	500-1200 (EA)	N	Se	I	Sil	2.50	2.50	2.12	2.12	.437	.437	.500	.500
20	Bridgeport F-5	M	1-3¾x4½		6-1200	49.0			N	In	I	Sil	1.50	1.50					.312	.312
21	Bridgeport 71	M	1-5½x6½		10-600	154.0			N	Se	L	NCI	2.25	2.25	2.00	2.00			.500	.500
22	Bridgeport F-10	M	2-3¾x4½		12-1200	99.0			N	In	I	Sil	1.50	1.50					.312	.312
23	Bridgeport 162	M	2-5½x6½		20-650	308.0			N	Se	L	NCI	2.25	2.25	2.00	2.00			.500	.500
24	Bridgeport 182	M	2-6½x7½		25-500	497.0			N	Se	L	NCI	2.37	2.37	2.00	2.00			.500	.500
25	Bridgeport 243	M	3-6½x7½		40-500	746.0			N	Se	L	NCI	2.37	2.37	2.00	2.00			.500	.500
26	Bridgeport F-20	M	4-2¾x4		27-2500	95.0			N	In	L	Sil	1.12	1.12					.312	.312
27	Bridgeport Pilot	M	4-4¼x5		55-2000	283.0		225-2000 (EA)	N	In	L	Sil	1.87	1.87	1.62	1.62			.375	.375
28	Bridgeport 304	M	4-5½x6½		45-700	617.0			N	Se	L	NCI	2.25	2.25	2.00	2.00			.500	.500
29	Bridgeport 404	M	4-6½x7½		65-600	995.0			N	Se	L	NCI	2.37	2.37	2.00	2.00			.500	.500
30	Bridgeport Piloteer	M	6-4x4¾		80-2200	358.0		300-2200 (EA)	N	In	L	Sil	2.00	2.00	1.75	1.75			.375	.375
31	Buda HP-205	T,Tr	4-3$\frac{13}{16}$x4½	51-2400	43-2400	205.0	4.76	112-1200 (EA)	N	In	L	2112	1.65	1.53	1.50	1.37	.344	.344	.372	.372
32	Buda HP-217	T,Tr	4-3$\frac{13}{16}$x4¾	55-2400	47-2400	217.0	5.50	123-1200 (EA)	N	In	L	2112	1.65	1.53	1.50	1.37	.344	.344	.372	.372
33	Buda 4HM-217-MD	M	4-3$\frac{13}{16}$x4¾		56-2400	217.0	5.70	148-1400 (EA)	N	In	L	2112	1.65	1.53	1.50	1.37	.344	.344	.372	.372
34	Buda 4HM-217-MHD	M	4-3$\frac{13}{16}$x4¾		48-1800	217.0	5.70	146-1400 (EA)	N	In	L	2112	1.65	1.53	1.50	1.37	.344	.344	.372	.372
35	Buda 4HM-217-HD	M	4-3$\frac{13}{16}$x4¾		30-1200	217.0	5.70	131-1200 (EA)	N	In	L	2112	1.65	1.53	1.50	1.37	.344	.344	.372	.372
36	Buda HP-234	T,Tr	4-3$\frac{13}{16}$x5⅛	59-2400	50-2400	234.0	5.83	133-1200 (EA)	N	In	L	2112	1.65	1.53	1.50	1.37	.344	.344	.372	.372
37	Buda KT-281	Tr	4-4⅛x5¼	49-1750	42-1750	281.0	4.50	148-1000 (EA)	N	Se	L	Sil	1.87	1.87	1.62	1.62	.281	.312	.372	.372
38	Buda YR-425	T	4-4¾x6	57-1400	48-1400	425.3	3.80	226-800 (EA)	N	Se	L	2112	2.37	2.37	2.12	2.12	.281	.312	.434	.434
39	Buda FRH	T,B,Tr	4-5½x6½	78-1200	66-1200	618.0	4.60	350-600 (EA)	N	Se	L	2112	2.50	2.50	2.25	2.25	.375	.375	.434	.434
40	Buda JK-4	Tr,Ind	4-6x7⅛	115-1200	98-1200	806.0	4.70	475-700 (EA)	N	Se	L	2112	2.93	2.93	2.50	2.50	.375	.375	.497	.497
41	Buda JL-877	Tr,Ind	4-6¼x7⅛	122-1200	104-1200	874.0	4.80	535-700 (EA)	N	Se	L	2112	2.93	2.93	2.50	2.50	.375	.375	.497	.497
42	Buda HP-260	T,B	6-3½x4½	68-2800	58-2800	260.0	4.75	139-1100 (EA)	N	In	L	2112	1.65	1.53	1.50	1.37	.344	.344	.372	.372
43	Buda HP-298	T,B,Tr	6-3¾x4½	77-2800	65-2800	298.0	4.75	161-1100 (EA)	N	In	L	2112	1.65	1.53	1.50	1.37	.344	.344	.372	.372
44	Buda HP-326	T,B,Tr	6-3$\frac{13}{16}$x4¾	78-2400	66-2400	326.0	5.40	188-1000 (EA)	N	In	L	2112	1.65	1.53	1.50	1.37	.344	.344	.372	.372
45	Buda HP-351	T,Tr	6-3$\frac{13}{16}$x5⅛	84-2400	71-2400	351.0	5.83	201-1000 (EA)	N	In	L	2112	1.65	1.53	1.50	1.37	.344	.344	.372	.372
46	Buda 6HM-326-MD	M	6-3$\frac{13}{16}$x4¾	80-2400	80-2400	326.0	5.70	225-900 (EA)	N	In	L	2112	1.65	1.53	1.50	1.37	.344	.344	.372	.372
47	Buda 6HM-326-MHD	M	6-3$\frac{13}{16}$x4¾		70-1800	326.0	5.70	225-900 (EA)	N	In	L	2112	1.65	1.53	1.50	1.37	.344	.344	.372	.372
48	Buda 6HM-326-HD	M	6-3$\frac{13}{16}$x4¾		46-1200	326.0	5.70	200-900 (EA)	N	In	L	2112	1.65	1.53	1.50	1.37	.344	.344	.372	.372
49	Buda K-393	T,B,Tr	6-4$\frac{3}{16}$x4¾	101-2400	86-2400	393.0	4.80	216-1100 (EA)	N	In	L	2112	1.90	1.78	1.75	1.62	.400	.400	.372	.372
50	Buda K-428	T,B,Tr	6-4⅜x4¾	107-2400	91-2400	428.0	5.33	240-1100 (EA)	N	In	L	2112	1.90	1.78	1.75	1.62	.400	.400	.372	.372
51	Buda 6KM-428-MD	M	6-4⅜x4¾		110-2400	428.0	5.50	299-1200 (EA)	N	In	L	2112	1.90	1.78	1.75	1.62	.400	.400	.372	.372
52	Buda 6KM-428-MHD	M	6-4⅜x4¾		96-1800	428.0	5.50	299-1200 (EA)	N	In	L	2112	1.90	1.78	1.75	1.62	.400	.400	.372	.372
53	Buda 6KM-428-HD	M	6-4⅜x4¾		60-1200	428.0	5.50	278-900 (EA)	N	In	L	2112	1.90	1.78	1.75	1.62	.400	.400	.372	.372
54	Buda L-525	T,B,Tr	6-4½x5½	110-2400	94-2400	525.0	4.75	287-800 (EA)	N	In	L	2112	1.90	1.78	1.75	1.62	.400	.400	.372	.372
55	Buda LO-525	T,B,Tr	6-4½x5½	135-2400	115-2400	525.0	5.00	330-1100 (EA)	N	In	I	2112	1.96	1.68	1.75	1.50	.468	.468	.372	.372
56	Buda GF-638	T,B,Tr	6-4¾x6	134-2000	114-2000	638.0	4.75	347-1100 (EA)	N	Se	L	2112	2.50	2.37	2.25	2.12	.375	.375	.434	.434
57	Buda M-766	T,B,Tr	6-5x6½	155-1800	132-1800	765.8	5.00	425-1000 (EA)	N	In	I	2112	2.39	2.14	2.12	1.87	.540	.540	.435	.435
58	Buda JK-6	Tr,Ind	6-6x7¼	188-1400	160-1400	1230.0	4.70	690-700 (EA)	N	Se	L	2112	2.93	2.93	2.50	2.50	.438	.438	.497	.497
59	Buda JL-1335	Tr,Ind	6-6¼x7¼	164-1000	140-1000	1334.6	4.40	780-600 (EA)	N	Se	L	2112	2.93	2.93	2.50	2.50	.438	.438	.497	.497
60	Buda P-1879	Ind	6-6¾x8¾	232-1000	197-1000	1879.0	4.50	1110-750 (EA)	W	In	I	2112	2.71	2.53	2.50	2.28	.703	.703	.558	.558
61	Buda PHG-1879	Ind	6-6¾x8¾	232-1000	197-1000	1879.0		1200-750 (EA)	W	In	I	2112	2.71	2.53	2.50	2.28	.703	.703	.558	.558
62	Buffalo BA	M,Ind	4-3½x5	45-1800	40-1800	192.0	5.00	131-1400 (EA)	N	In	L	NCI	1.93	1.93	1.75	1.75	.312	.375	.375	.375
63	Buffalo RA-4	M,Ind	4-5⅞x7	120-1200	110-1200	759.0	4.60	525-1200 (EA)	N	Se	I	Sil	3.09	2.84	2.87	2.62	.540	.540	.500	.500
64	Buffalo RAB-4	M,Ind	4-6½x7	145-1200	130-1200	929.0	5.00	635-1200 (EA)	N	Se	I	Sil	3.09	2.84	2.87	2.62	.625	.540	.500	.500
65	Buffalo ATT-4	M,Ind	4-8¼x9	275-1200	250-1200	1925.0	4.50	1176-900 (EA)	N	Se	L	Sil	4.12	4.06	3.62	3.44	.812	.812	.683	.683
66	Buffalo RA-6	M,Ind	6-5⅞x7	180-1200	160-1200	1138.0	4.60	790-1200 (EA)	N	Se	I	Sil	3.09	2.84	2.87	2.62	.540	.540	.500	.500
67	Buffalo RAB-6	M,Ind	6-6½x7	215-1200	195-1200	1393.0	5.00	955-1200 (EA)	N	Se	I	Sil	3.09	2.84	2.87	2.62	.625	.540	.500	.500
68	Buffalo ATT-6	M,Ind	6-8¼x9	425-1200	375-1200	2887.0	4.50	1764-900 (EA)	N	Se	L	Sil	4.12	4.06	3.62	3.44	.812	.812	.683	.683
69	Buffalo RA-8	M,Ind	8-5⅞x7	240-1200	220-1200	1518.0	4.60	1050-1200 (EA)	N	Se	I	Sil	3.09	2.84	2.87	2.62	.540	.540	.500	.500
70	Buffalo RAB-8	M,Ind	8-6½x7	300-1200	270-1200	1858.0	5.00	1275-1200 (EA)	N	Se	I	Sil	3.09	2.84	2.87	2.62	.625	.540	.500	.500
71	Buffalo ATT-8	M,Ind	8-8¼x9	550-1200	500-1200	3849.0	4.50	2352-900 (EA)	N	Se	L	Sil	4.12	4.06	3.62	3.44	.812	.812	.683	.683
72	Chevrolet 1942	C,T,B	6-3½x3¾	90-3300	83-3200	216.5	6.50	168-1100 (EA)	N	In	I	AS	1.64	1.46	1.25	1.20	.294	.312	.341	.340
73	Chevrolet 1942	T,B	6-3$\frac{9}{16}$x3$\frac{15}{16}$	93-3100	83.5-3000	235.5	6.62	182-1000 (EA)	N	In	I	AS	1.64	1.46	1.25	1.20	.294	.312	.341	.340
74	Chris-Craft ■B	M	4-3¼x4		60-3200	132.7	7.50	108-2400 (EA)	N	In	L	CNS	1.50	1.37	1.25	1.12	.312	.312	.310	.310
75	Chris-Craft ■▼K	M	6-3$\frac{7}{16}$x4⅛		95-3200	229.7	7.35	173-1800 (EA)	N	In	L	CNS	1.60	1.39	1.46	1.25	.312	.312	.310	.310
76	Chris-Craft ■▼M	M	6-4x4¼		130-3000	320.4	7.50	239-2400 (EA)	N	In	L	Sil	1.87	1.78	1.71	1.56	.356	.356	.372	.372
77	Chris-Craft ■▼W	M	6-4¼x4¾		160-3000	404.3	6.40	322-1500 (EA)	N	In	L	AUS	2.06	1.87	1.81	1.62	.388	.388	.372	.372
78	Chrysler Ace-M6	M	6-3¼x4⅜		92-3200	218.0	6.80	180-1400 (EA)	N	In	L	Sil	1.53	1.41	1.41	1.28	.375	.375	.340	.340
79	Chrysler Crown-M7	M	6-3$\frac{7}{16}$x4½		115-3200	251.0	6.50	205-1400 (EA)	N	In	L	Sil	1.72	1.53	1.56	1.37	.375	.375	.340	.340
80	Chrysler Royal-M8	M	8-3¼x4⅞		143-3200	323.5	6.80	260-1400 (EA)	N	In	L	Sil	1.53	1.35	1.41	1.22	.375	.375	.340	.340
81	Climax G4C	Ind	4-4½x5¼	46-1200	44-1200	334.0	4.75	216-800 (EA)	W	In	I	Sil	2.00	2.00	1.75	1.75	.406	.406	.375	.375
82	Climax H4B	Ind	4-5⅛x6¼	73-1200	68-1200	516.0	4.10	340-800 (EA)	W	In	I	Sil	2.37	2.37	2.12	2.12	.437	.437	.437	.437

(For abbreviations see pages 120-121)

GASOLINE ENGINES

Stem Diameter (In.) Intake	Stem Diameter (In.) Exhaust	Valves: Seats Angle (Deg.)	Inserts Used?	Insert Material (S.A.E. No.)	Camshaft Drive—Type	Pistons: Material	Weight with Pins, Rings, Bushings (Oz.)	Piston Pin—Diameter and Length (In.)	Number of Rings per Piston	Connecting Rods: Material	Center to Center Length (In.)	Weight with Bushing and Cap (Oz.)	Crankshaft: Material	Counter Balance Used	Crank-Pin Diameter and Length (In.)	Main Bearings: Number	Diameter and Length (In.) Front	Diameter and Length (In.) Rear	Oil Pressure to—	Spark Plug—Thread Size	Carburetor: Make	Size	Engine Weight without Carburetor or Ignition (Lb.)	Overall Dimensions (In.) Width	Height	Length	Line Number
341	.341	45	N	......	HG	CI	39	.813x2.87	3	1040	6½	29	1045	N	1.93x1.22	3	2.25x1.62	2.25x1.50	aceg	14 mm	Zen	⅞	360	16 5/16	31⅝	27	1
372	.372	45	E	TA	HG	CI	67	.989x3.50	4	1040	7½	42	1045	N	2.37x1.54	3	2.43x1.62	2.50x1.75	abcdeg	14 mm	Zen	1	520	23	31⅜	33½	2
372	.372	30	E	TA	HG	CI	92	1.31x4.06	5	1040	9½	92	1045	N	2.37x2.37	3	2.50x2.31	2.50x2.75	abcdeg	⅞-18	Zen	1¼	985	26	37½	43¾	3
497	.497	45	E	TA	HG	CI	162	1.50x4.87	4	1040	13	182	1045	N	2.75x3.24	3	3.00x3.50	3.00x4.75	abcdeg	⅞-18	Zen	1½	2020	27	44⅞	53	4
497	.497	45	E	TA	HG	CI	162	1.50x4.87	4	1040	13	182	1945	N	2.75x3.24	4	3.00x3.50	3.00x4.75	abcdeg	⅞-18	Zen(2)	1½	2810	29¾	63 1/16	72½	5
437	.437	45	E	71360	HG	AI	43	1.12x3.28	4	2340	10⅛	65	1050	N	2.37x1.44	7	3.25x1.87	3.25x2.60	abcde	18 mm	Zen	1¼	1165	27½	41	45	6
437	.437	45	E	71360	HG	AI	51	1.12x3.68	4	2340	10¼	78	1050	N	2.50x1.58	7	3.25x1.87	3.25x2.87	abcde	18 mm	Str	1¾	1320	27½	41½	47	7
437	.437	45	E	71360	HG	AI	57	1.12x3.93	4	2340	10¼	78	1050	N	2.50x1.58	7	3.25x1.87	3.25x2.87	abcde	18 mm	Str	1¾	1330	27½	41½	47	8
12	.312	45	N	......	HG	AI	6	.625x1.87	3	1045	5¾	14	1045	N	1.31x1.25	2	2.50x1.50	2.50x1.50	abcde	14 mm	Til	¾	160	12¾	17⅝	29	9
12	.312	45	N	......	HG	AI	6	.625x2.00	3	1045	5¾	14	1045	Y	1.31x1.25	3	2.50x1.50	2.50x1.50	abcde	14 mm	Zen	¾	128	12¾	17⅝	18¾	10
12	.312	45	N	......	HG	AI	6	.625x2.00	3	1045	5¾	14	1045	N	1.31x1.25	3	2.50x1.50	2.50x1.50	abcde	......	Zen	13/16	165	12¾	17⅝	29	11
......	......				HG	CI	......	1.17x4.00	4	AS	11	......	CNS	N	2.56x2.00	3	2.12x4.25	2.12x2.25	abcd	......	Str	1¼	650	12 7/16	19½	53¾	12
75	.375	45	N	......	HG	SS	80	1.17x4.00	4	1045	11	64	1045	N	2.50x2.50	3	2.50x4.25	2.50x3.50	abcde	......	Str	1¼	600	21	29¾	37⅛	13
75	.375	45	N	......	HG	SS	72	1.17x4.00	5	1045	11	64	1045	N	2.50x2.50	3	2.50x4.25	2.50x3.50	abcder	......	Str	1¼	950	16	18	53	14
37	.437	45	N	......	HG	SS	64	1.17x3.87	4	CNS	11	65	CNS	N	2.50x2.00	3	2.75x4.50	2.75x3.00	abce	......	Str	1½	800	25¾	33¾	49	15
37	.437	45	N	......	HG	SS	64	1.17x3.87	4	AS	......	......	CNS	N	2.50x2.00	3	2.75x4.50	2.75x3.00	abcdeg	......	Str	1½	800	19¾	24¾	65	16
7	.437	45	N	......	HG	SS	76	1.25x3.87	5	CNS	11	65	CNS	N	2.50x2.00	3	2.75x4.50	2.75x3.00	abce	......	Str	1½	875	25¾	33¾	49	17
7	.437	45	N	......	HG	SS	70	1.25x3.87	5	AS	11	65	CNS	N	2.50x2.00	3	2.75x4.50	2.75x4.50	abcdeg	......	Str	1½	900	19¾	24¾	65	18
0	.500	45	N	......	BG	SS	72	1.37x4.00	5	AS	12	80	CNS	Y	2.62x2.67	7	2.62x5.00	2.62x3.50	abcd	......	Str	1¾	1450	20	30	74	19
2	.312	45	N	......	SG	CI	......	.750x3.37	3	DFS	......	......	......	Y	1.37x1.50	2	1.37x2.50	1.37x2.50	Splash	⅞-18	......	1	204	13	24	30	20
0	.500	45	N	......	SG	CI	124	1.25x5.25	5	DFS	12½	136	......	N	2.00x3.00	2	2.00x5.50	2.00x5.50	Splash	⅞-18	......	1¼	510	20	34	47	21
2	.312	45	N	......	HG	CI	......	.750x3.37		DFS	......	......	......	Y	1.37x1.50	2	1.37x2.50	1.37x2.50	Splash	⅞-18	......	1¼	308	13	25	33	22
0	.500	45	N	......	HG	CI	124	1.25x5.25	5	DFS	12½	136	......	N	2.00x3.00	3	2.00x5.50	2.00x5.50	ML	⅞-18	......	1¼	1010	20	35	56	23
0	.500	45	N	......	SG	CI	272	1.50x6.00	5	DFS	15½	208	......	N	2.37x3.00	5	2.37x6.00	2.37x6.00	ML	⅞-18	......	1½	......	21	40	63	24
0	.500	45	N	......	HG	CI	272	1.50x6.00	5	DFS	15½	208	......	N	2.37x3.00	4	2.37x6.00	2.37x6.00	ML	⅞-18	......	1½	2000	21	40	77	25
	.312	45	N	......	HG	CI	......	.625x2.37	3	DFS	......	......	DFS	N	1.50x1.75	3	1.50x2.75	1.50x2.75	ab	⅞-18	......	1¼	382	17	22	35	26
	.375	45	Bo	AS	HG	CI	64	1.37x3.50	4	DFS	9½	56	......	N	2.00x2.25	3	2.00x3.00	2.00x3.25	abcde	⅞-18	......	1¼	920	17	28½	53	27
	.500	45	N	......	HG	CI	124	1.25x5.25	5	DFS	12½	136	......	N	2.00x3.00	5	2.00x5.50	2.00x5.50	ML	⅞-18	......	1½	1700	20	35	76	28
	.500	45	N	......	HG	CI	272	1.50x6.00	5	DFS	15½	208	......	N	2.37x3.00	5	2.37x6.00	2.37x6.00	ML	⅞-18	......	1½	2400	21	40	87	29
	.375	45	Bo	AS	HG	CI	64	1.25x3.50	4	DFS	9⅝	56	......	N	2.50x1.75	7	3.00x2.00	3.00x3.00	abcde	⅞-18	......	1½	1500	18	30	64	30
	.372	45	N	......	HG	CI	42	1.12x3.22	4	CS	9½	42	CS	N	2.12x1.62	5	3.00x1.50	3.00x2.12	abcde	18 mm	Zen	1¼	590	26	29 31/32	31 31/32	31
	.372	45	N	......	HG	CI	42	1.12x3.22	4	CS	9½	42	CS	N	2.12x1.62	5	3.00x1.50	3.00x2.12	abcde	18 mm	Zen	1¼	590	25¾	31 1/16	38 9/32	32
	.372	45	N	......	HG	CI	42	1.12x3.22	4	CS	9½	42	CS	N	2.12x1.62	5	3.00x1.50	3.00x2.12	abcder	18 mm	Str	1¼	770	23¼	31 1/16	43⅜	33
	.372	45	N	......	HG	CI	42	1.12x3.22	4	CS	9½	42	CS	N	2.12x1.62	5	3.00x1.50	3.00x2.12	abcder	18 mm	Str	1¼	770	23¼	31 1/16	43⅜	34
	.372	45	N	......	HG	CI	42	1.12x3.22	4	CS	9½	42	CS	N	2.12x1.62	5	3.00x1.50	3.00x2.12	abcder	18 mm	Str	1¼	770	23¼	31 1/16	43⅜	35
	.372	45	N	......	HG	CI	42	1.12x3.22	4	CS	9½	42	CS	N	2.12x1.62	5	3.00x1.50	3.00x2.12	abcde	18 mm	Str	1¼	770	23¼	31 1/16	43⅜	36
	.372	45	N	......	HG	CI	65	1.50x3.31	4	CS	11¼	89	CS	N	2.00x2.25	3	1.87x2.87	2.12x3.44	abcde	⅞-18	Zen	1¼	875	25¾	33¼	40 15/16	37
	.434	45	E	JM	HG	CI	111	1.43x4.11	4	AS	13¼	106	CS	N	2.50x2.87	3	2.50x3.00	2.50x4.50	abcde	⅞-18	Zen	1½	1087	25¾	36 15/16	47½	38
	.434	45	E	DC	HG	CI	144	1.37x4.87	4	AS	14⅜	163	CS	N	2.50x3.12	3	2.25x4.12	2.62x4.69	abcde	⅞-18	Zen	1½	1430	28¾	40 7/16	52 9/16	39
	.497	30	E	DC	HG	CI	172	2.00x5.12	4	AS	14⅝	252	CS	N	3.00x3.31	3	3.00x4.75	3.00x4.75	abcde	⅞-18	Zen	1¾	1925	30	44 11/32	58½	40
	.497	30	E	DC	HG	CI	199	2.00x5.33	4	AS	14⅝	227	CS	N	3.00x3.31	3	3.00x4.75	3.00x4.75	abcde	⅞-18	Zen	1¾	1925	30	40 11/32	58½	41
	.372	45	N	......	HG	CI	37	1.12x2.97	4	CS	9½	42	CS	N	2.12x1.62	7	3.00x1.50	3.00x2.12	abcde	18 mm	Zen	1½	825	25¾	33 1/16	39 23/32	42
	.372	45	N	......	HG	CI	42	1.12x3.25	4	CS	9½	42	CS	N	2.12x1.62	7	3.00x1.50	3.00x2.12	abcde	18 mm	Zen	1½	825	25¾	33 1/16	39 23/32	43
	.372	45	N	......	HG	CI	42	1.12x3.25	4	CS	9½	42	CS	N	2.12x1.62	7	3.00x1.50	3.00x2.12	abcde	18 mm	Zen	1½	885	25¾	33 1/16	39 23/32	44
	.372	45	N	......	HG	CI	42	1.12x3.25	4	CS	9½	42	CS	N	2.12x1.62	7	3.00x1.50	3.00x2.12	abcde	18 mm	Zen	1½	905	25¾	33 1/16	39 23/32	45
	372	45	N	......	HG	CI	42	1.12x3.25	4	CS	9½	42	CS	N	2.12x1.62	7	3.00x1.50	3.00x2.12	abcder	18 mm	Str	1½	1010	22⅝	28 11/16	54½	46
	372	45	N	......	HG	AI	42	1.12x3.25	4	CS	9½	42	CS	N	2.12x1.62	7	3.00x1.50	3.00x2.12	abcder	18 mm	Str	1½	1010	22⅝	28 11/16	54½	47
	372	45	N	......	HG	AI	42	1.12x3.25	4	CS	9½	42	CS	N	2.12x1.62	7	3.00x1.50	3.00x2.12	abcder	18 mm	Str	1½	1010	22⅝	28 11/16	54½	48
	372	45	N	......	HG	CI	66	1.25x3.47	4	CS	9½	58	CS	N	2.37x1.75	7	3.00x1.75	3.00x2.50	abcde	18 mm	Zen	1¾	905	25¾	30 17/32	47 9/32	49
	372	45	N	......	HG	AI	68	1.25x3.82	4	CS	9½	58	CS	N	2.37x1.75	7	3.00x1.75	3.00x2.50	abcde	18 mm	Zen	1¾	905	25¾	30 17/32	47 9/32	50
	372	45	N	......	HG	CI	68	1.25x3.82	4	CS	9½	58	CS	N	2.37x1.75	7	3.00x1.75	3.00x2.50	abcder	18 mm	Str	1¾	1320	24 13/16	29½	60 11/16	51
	372	45	N	......	HG	CI	68	1.25x3.82	4	CS	9½	58	CS	N	2.37x1.75	7	3.00x1.75	3.00x2.50	abcder	18 mm	Str	1¾	1320	24 13/16	29½	60 11/16	52
	372	45	N	......	HG	CI	68	1.25x3.82	4	CS	9½	58	CS	N	2.37x1.75	7	3.00x1.75	3.00x2.50	abcder	18 mm	Str	1¾	1320	24 13/16	29½	60 11/16	53
	372	45	E	DC	HG	CI	88	1.25x3.81	4	CS	11	66	CS	N	2.37x1.75	7	3.00x1.75	3.00x2.50	abcde	18 mm	Zen	1¾	950	25¾	33 7/32	47 9/32	54
	372	30	E	JM	HG	AI	88	1.25x3.81	5	AS	11	78	CS	N	2.37x1.75	7	3.00x1.75	3.00x2.50	abcdeg	14 mm	Zen	1¾	1195	27 9/16	38 27/32	49⅜	55
	434	30	E	DC	HG	CI	94	1.62x4.00	4	AS	13¼	139	CS	N	3.00x2.25	4	3.00x2.25	3.00x3.69	abcde	18 mm	Zen	1¾	1525	28¾	43 27/32	53 13/16	56
	[illegible]	30	E	DC	HG	AI	127	1.75x4.15	5	AS	12½	164	CS	N	3.24x2.12	7	3.50x3.00	3.50x3.00	abcdeg	18 mm	Zen	1¾	2150	31 17/32	49 9/16	57½	57
	97	30	E	DC	HG	CI	196	2.00x5.12	4	AS	15¼	239	CS	Y	3.50x3.31	4	3.50x4.75	3.50x4.75	abcde	⅞-18	Zen	2	3700	28⅝	43	74 9/16	58
	97	30	E	DC	HG	CI	199	2.00x5.33	4	AS	15¼	239	CS	Y	3.50x3.31	4	3.50x4.75	3.50x4.75	abcde	⅞-18	Zen	2	3700	28⅝	43	74 9/16	59
	58	45	E	DC	HG	Ala	263	2.75x5.53	5	CS	17¾	430	CS	Y	3.75x3.50	7	3.75x2.31	3.75x3.48	abcdeg	18 mm	Zen(2)	2	9000	48	68 5/16	86 5/32	60
	58	45	E	DC	HG	Ala	263	2.75x5.53	5	CS	17¾	430	CS	Y	3.75x3.50	7	3.75x2.31	3.75x3.48	abcdeg	18 mm	Zen(2)	2	9000	48	68 5/16	86 5/32	61
	75	45	N	......	HG	CI	37	1.09x3.31	3	1045	10¼	50	1045	N	1.87x2.12	3	2.25x3.00	2.18x2.87	Splash	⅞-18	Zen	1	720	22	28	53	62
	00	45	E	SA	HG	AI	132	1.50x5.62	5	3135	14	147	3140	Y	3.00x2.37	5	3.75x4.12	3.75x4.50	abce	⅞-18	Zen	2½	2500	24	46	78	63
	00	45	E	SA	HG	AI	154	1.68x6.25	5	3135	14	147	3140	Y	3.00x2.37	5	3.75x4.12	3.75x4.50	abe	⅞-18	Zen	2½	2700	24	46	78	64
	33	45	E	SA	HG	AI	312	2.25x7.62	5	3135	21	186	3140	Y	4.25x4.00	5	5.00x7.00	5.00x7.00	abce	14 mm	Zen(2)	2½	7000	47	54	132	65
	00	45	E	SA	HG	AI	132	1.50x5.62	5	3135	14	147	3140	Y	3.00x2.37	7	3.75x4.12	3.75x4.50	abe	⅞-18	Zen(2)	2	3000	24	46	94	66
	00	45	E	SA	HG	AI	154	1.68x6.25	5	3135	14	147	3140	Y	3.00x2.37	7	3.75x4.12	3.75x4.50	abe	⅞-18	Zen(2)	2	3200	24	46	94	67
	3	45	E	SA	HG	AI	312	2.25x7.62	5	3135	21	186	3140	Y	4.25x4.00	7	5.00x7.00	5.00x7.00	abce	14 mm	Zen(3)	2½	11600	47	54	160	68
	0	45	E	SA	HG	AI	132	1.50x5.62	5	3135	14	147	3140	Y	3.00x2.37	9	3.75x4.12	3.75x4.50	abe	⅞-18	Zen(2)	2½	4000	24	46	111	69
	0	45	E	SA	HG	AI	154	1.68x6.25	5	3135	14	147	3140	Y	3.00x2.37	9	3.75x4.12	3.75x4.50	abe	⅞-18	Zen(2)	2½	4300	24	46	111	70
	3	45	E	SA	HG	AI	312	2.25x7.62	5	3135	21	186	3140	Y	4.25x4.00	9	5.00x7.00	5.00x7.00	abce	14 mm	Zen(4)	2½	15000	47	54	188	71
	0	30	N	......	HG	CI	35	.864x3.15	3	DFS	6 13/16	31	DFS	Y	2.31x1.5	4	2.69x1.19	2.78x1.62	abcg	10 mm	Car	1¼	......	......	......	......	72
		30	N	......	HG	CI	38	.864x3.15	3	DFS	6 13/16	31	DFS	Y	2.31x1.5	4	2.69x1.19	2.78x1.62	abcg	10 mm	Car	1¼	......	......	......	......	73
		30	N	......	HG	AI	21	.750x2.87	3	3140	6 9/16	22	1045	N	1.75x1.12	3	1.98x1.62	1.98x1.62	abr	14 mm	Zen	1¼	456*	24⅛	23 1/16	31 11/16	74
		30	N	......	HG	AI	25	.875x2.87	3	1035	7	29	1045	N	1.98x1.12	7	2.49x1.93	2.49x1.37	abr**	14 mm	Zen	1⅜	626*	24⅛	25½	40	75
		30	N	......	HG	AI	36	1.00x3.50	3	1040	8	40	1045	N	1.98x1.50	7	2.49x2.12	2.49x1.37	abr	14 mm	Zen	1¾	850*	26 5/16	27 9/32	46 5/16	76
		30	N	......	HG	AI	44	1.12x3.68	4	3140	8⅞	52	1045	Y	2.24x1.50	7	2.62x2.75	2.62x1.75	aber	14 mm	Zen	2	1232*	26⅞	29 9/16	53 1/16	77
		45	E	CNT	HG	CI	33	.859x2.75	4	T-1335	7 15/16	31	1040	Y	2.06x1.25	4	2.50x1.44	2.50x1.87	abce	18 mm	Zen	1¼	665	......	......	......	78
		45	E	CNT	HG	CI	37	.859x2.87	4	T-1335	7⅞	34	1040	Y	2.12x1.37	4	2.50x1.59	2.50x1.87	abce	18 mm	Zen	1½	785	......	......	......	79
		45	E	CNT	HG	AI	23	.859x2.75	4	T-1335	9	36	1040	Y	2.18x1.37	5	2.70x1.65	2.70x2.09	abce	18 mm	Zen(2)	1½	990	......	......	......	80
		45	E	CI	HG	CI	85	1.31x4.06	4	1045	10½	167	1045	N	2.37x2.12	3	2.37x2.31	2.37x2.75	abcdeg	⅞-18	Zen	1¼	825	25¾	37	41¼	81
		45	E	CI	HG	CI	142	1.50x4.31	4	1045	11¾	139	1045	N	2.75x2.50	3	3.00x2.87	3.00x3.62	abcdeg	⅞-18	Zen	1½	1350	28¾	43	47¾	82

(For abbreviations see pages 120-121)

American Gasoline

Line Number	Engine Make and Model	Designed for	Number of Cylinders, Bore and Stroke (In.)	Maximum Brake Hp at Specified R.P.M.: With Bare Engine	Maximum Brake Hp at Specified R.P.M.: With Standard Accessories	Piston Displacement (Cu. In.)	Compression Ratio	Maximum Torque at R.P.M. (Lb. Ft.) with or without Accessories	Cylinder Liners—Type	Crankcase—Upper Half Integral with Cylinders	Arrangement	Exhaust Head Material (S.A.E. No.)	Valves: Max. Head Diameter (In.) Intake	Max. Head Diameter Exhaust	Min. Port Diameter (In.) Intake	Min. Port Diameter Exhaust	Lift (In.) Intake	Lift Exhaust	Stem Diameter (In.) Intake	Stem Diameter Exhaust
1	Climax N4B	Ind	4-5¾x6½	102-1200	90-1200	675.0	4.30	450-700 (EA)	N	In	I	Sil	2.50	2.50	2.25	2.25	.500	.500	.562	.562
2	Climax R4I	Ind	4-6x7	123-1200	112-1200	791.6	4.70	525-750 (EA)	N	Se	I	Sil	2.50	2.50	2.25	2.25	.500	.500	.562	.562
3	Climax R6U	Ind	6-6x7	142-1200	126-1200	1187.4	4.40	700-650 (BE)	N	Se	L	Sil	2.75	2.75	2.50	2.50	.375	.375	.625	.625
4	Climax R6I	Ind	6-6x7	183-1200	165-1200	1187.4	4.70	802-700 (EA)	N	Se	I	CNS	2.50	2.50	2.25	2.25	.500	.500	.562	.562
5	Climax R8I	Ind	8-6x7	245-1200	221-1200	1583.2	4.70	1085-750 (EA)	N	Se	I	Sil	2.50	2.50	2.25	2.25	.500	.500	.562	.562
6	Continental Y-4069	C,Tr,Ind	4-2½x3½	28-3500	....	68.7	6.15	52-2000 (BE)	N	In	L	Sil	1.20	1.01	1.06	.875	.291	.292	.314	.313
7	Continental Y-4091	C,Tr,Ind	4-2⅞x3½	37-3500	....	90.9	6.00	70-1800 (BE)	N	In	L	Sil	1.20	1.01	1.06	.875	.291	.292	.314	.313
8	Continental Y-4112	C,Tr,Ind	4-3$\frac{3}{16}$x3½	46-3400	....	111.7	6.00	87-1800 (BE)	N	In	L	Sil	1.20	1.01	1.06	.875	.291	.292	.314	.313
9	Continental F-4124	C,T,Tr,Ind	4-3x4⅜	48-3400	....	123.7	6.00	94-1800 (BE)	N	In	L	Sil	1.51	1.32	1.37	1.18	.281	.280	.341	.339
10	Continental F-4140	C,T,Tr,Ind	4-3$\frac{3}{16}$x4⅜	51-3400	....	139.6	6.00	106-1600 (BE)	N	In	L	Sil	1.51	1.32	1.37	1.18	.281	.280	.341	.339
11	Continental F-4162	C,T,Tr,Ind	4-3$\frac{7}{16}$x4⅜	58-3200	....	162.4	5.75	124-1600 (BE)	N	In	L	Sil	1.51	1.32	1.37	1.18	.281	.280	.341	.339
12	Continental F-6186	C,T,Tr,Ind	6-3x4⅜	64-3400	....	185.6	6.40	138-1400 (BE)	N	In	L	XCR	1.51	1.32	1.37	1.18	.281	.281	.341	.339
13	Continental F-6209	C,T,Tr,Ind	6-3$\frac{3}{16}$x4⅜	71-3200	....	209.5	5.75	155-1200 (BE)	N	In	L	Sil	1.51	1.32	1.37	1.18	.284	.284	.341	.339
14	Continental F-6226	C,T,Tr,Ind	6-3$\frac{5}{16}$x4⅜	76-3000	....	226.0	6.00	170-1200 (BE)	N	In	L	XCR	1.51	1.32	1.37	1.18	.281	.281	.341	.339
15	Continental A-6244	C,T,B,Ind	6-3$\frac{7}{16}$x4⅜	85-3000	....	243.6	6.02	182-1200 (BE)	N	In	L	St	1.57	1.32	1.43	1.18	.291	.291	.373	.372
16	Continental M-6271	T,B,Tr,Ind	6-3⅝x4⅜	92-3000	....	270.9	5.75	207-1200 (BE)	N	In	L	Sil	1.76	1.51	1.62	1.37	.354	.354	.404	.402
17	Continental M-6290	T,B,Tr,Ind	6-3¾x4⅜	99-3000	....	289.9	5.70	225-1200 (BE)	N	In	L	Sil	1.76	1.51	1.62	1.37	.354	.354	.404	.402
18	Continental M-6330	T,B,Tr,Ind	6-4x4⅜	107-2800	....	329.8	5.50	258-1000 (BE)	N	In	L	Sil	1.76	1.51	1.62	1.37	.354	.354	.404	.402
19	Continental B-6371	T,B,Ind	6-4⅛x4⅝	109-2600	....	370.9	5.74	280-1000 (BE)	N	In	L	St	1.89	1.64	1.75	1.50	.354	.354	.435	.432
20	Continental B-6405	T,B,Ind	6-4$\frac{5}{16}$x4⅝	115-2600	....	405.3	5.74	314-1000 (BE)	N	In	L	St	1.89	1.64	1.75	1.50	.354	.354	.435	.432
21	Continental 21R	T,B,Ind	6-4⅜x4¾	133-2400	....	428.4	4.63	323-1000 (BE)	N	In	I	AUS	2.06	1.87	1.81	1.62	.420	.420	.435	.433
22	Continental 22R	T,B,Ind	6-4½x5¼	141-2400	....	501.0	4.50	375-1000 (BE)	N	In	I	AUS	2.06	1.87	1.81	1.62	.420	.420	.435	.433
23	Continental R6572	T,B,M,Ind	6-4¾x5⅜	175-2750	....	571.7	6.25	436-1250 (BE)	N	In	I	St	2.14	1.89	2.00	1.75	.500	.500	.500	.495
24	Continental R6602	T,B,M,Ind	6-4⅞x5⅜	184-2600	....	601.9	6.00	460-1200 (BE)	N	In	I	St	2.14	1.89	2.00	1.75	.500	.500	.500	.495
25	Continental B6427	T,B,M,Ind	6-4$\frac{5}{16}$x4⅞	121-2500	....	427.2	6.60	332-900 (BE)	N	In	L	St	1.89	1.64	1.75	1.50	.354	.354	.435	.432
26	Ford 40	T	4-3$\frac{3}{16}$x3¾	....	40-3200†	119.5	6.00	84-1600 (BE)	D	In	L	CNS	1.51	1.28	....	....	.292	.292	.311	.310
27	Ford 90HP	C, T	6-3.3x4.4	....	90-3400†	225.8	6.70	180-1400 (BE)	...	In	L	CNS	1.65	1.51	....	....	.292	.292	.311	.310
28	Ford 90	C, T, B	8-3$\frac{1}{16}$x3¾	....	90-3800†	221.0	(1)	(5) (BE)	D	In	L	CNS	1.51	1.51	....	....	.292	.292	.311	.310
29	Ford 100	C, T, B	8-3$\frac{3}{16}$x3¾	....	100-3800†	239.0	6.40	176-2000 (BE)	...	In	L	CNS	1.51	1.51	....	....	.292	.292	.311	.310
30	G. M. C. 228	T, B	6-3$\frac{9}{16}$x3$\frac{13}{16}$	95-3200	85-3000	228.0	6.75	178-1000 (EA)	N	In	I	Sil	1.64	1.47	1.25	1.16	.289	.307	.343	.343
31	G. M. C. 248	T, B	6-3$\frac{23}{32}$x3$\frac{13}{16}$	100-3100	89-3000	248.5	6.75	195-1000 (EA)	N	In	I	Sil	1.64	1.47	1.25	1.16	.289	.307	.343	.343
32	G. M. C. 270	T	6-3$\frac{25}{32}$x4	104-3000	95-3000	270.0	6.75	216-1000 (EA)	N	In	I	Sil	1.64	1.47	1.25	1.16	.289	.307	.343	.343
33	G. M. C. 278	T	6-3⅝x4½	100-2800	86-2800	278.6	6.00	213-1000 (EA)	N	Se	I	CHS	1.81	1.56	1.44	1.37	.333	.333	.375	.375
34	G. M. C. 308	T, B	6-3$\frac{13}{16}$x4½	111-2800	87-2800	308.2	6.00	239-800 (EA)	N	Se	I	CHS	1.81	1.46	1.44	1.37	.333	.333	.375	.375
35	G. M. C. 361	T	6-4⅛x4½	122-2800	106-2500	360.8	6.00	265-800 (EA)	N	Se	I	CHS	1.94	1.72	1.50	1.50	.406	.406	.375	.375
36	G. M. C. 426	T	6-4¼x5	145-2600	127-2400	425.6	6.00	322-1000 (EA)	N	Se	I	CHS	1.94	1.72	1.50	1.50	.406	.406	.375	.375
37	G. M. C. 451	T, B	6-4⅜x5	149-2600	130-2400	450.9	6.00	350-1000 (EA)	N	Se	I	CHS	1.94	1.72	1.50	1.50	.406	.406	.375	.375
38	G. M. C. 477	T, B	6-4½x5	153-2600	135-2400	477.1	6.00	365-1000 (EA)	N	Se	I	CHS	1.94	1.72	1.50	1.50	.406	.406	.375	.375
39	G. M. C. 529	B	6-4⅝x5¼	158-2500	144-2300	529.2	5.50	387-1000 (EA)	N	Se	I	CHS	2.12	1.94	1.66	1.62	.406	.406	.437	.437
40	G. M. C. 707	B	6-5x6	175-2200	160-2100	706.8	4.83	555-1000 (EA)	D	Se	I	CHS	2.44	2.17	1.75	1.75	.413	.413	.437	.500
41	Gray Light Four	M	4-2½x3½	....	16-1800	69.0	5.50	....	N	In	L	Sil	1.20	1.01	1.06	.875	.291	.292	.314	.312
42	Gray Sea Scout	M	4-2⅞x3½	....	37-3000	91.0	6.50	....	N	In	L	Sil	1.20	1.01	1.06	.875	.291	.292	.314	.312
43	Gray Phantom 4-45	M	4-2⅞x3½	....	45-3600	91.0	7.50	....	N	In	L	Sil	1.20	1.01	1.06	.875	.291	.292	.314	.312
44	Gray Racing-91	M	4-2⅞x3½	....	65-5000	91.0	9.20	....	N	In	L	Sil	1.32	1.23	1.16	1.07	.284	.284	.314	.312
45	Gray Racing-100	M	4-2$\frac{15}{16}$x3⅝	....	75-5000	98.0	10.00	....	N	In	L	Sil	1.32	1.23	1.16	1.07	.284	.284	.314	.312
46	Gray Four-22	M	4-3$\frac{3}{16}$x3½	....	45-3000	112.0	6.50	....	N	In	L	Sil	1.20	1.01	1.06	.875	.291	.292	.314	.312
47	Gray Four-40	M	4-3$\frac{3}{16}$x4⅜	....	55-3000	140.0	5.50	....	N	In	L	Sil	1.51	1.32	1.37	1.18	.331	.331	.340	.338
48	Gray Phantom 4-62	M	4-3$\frac{3}{16}$x4⅜	....	62-3600	140.0	7.20	....	N	In	L	Sil	1.51	1.32	1.37	1.18	.331	.331	.340	.338
49	Gray Four-52	M	4-3$\frac{7}{16}$x4⅜	....	57-2600	162.0	6.00	....	N	In	L	Sil	1.51	1.32	1.37	1.18	.331	.331	.340	.338
50	Gray Phantom 4-75	M	4-3$\frac{7}{16}$x4⅜	....	75-3600	162.0	7.00	....	N	In	L	Sil	1.51	1.32	1.37	1.18	.331	.331	.340	.338
51	Gray Phantom 4-86	M	4-3$\frac{7}{16}$x4⅜	....	86-3600	162.0	8.00	....	N	In	L	Sil	1.51	1.32	1.37	1.18	.331	.331	.340	.338
52	Gray Six-51	M	6-3¼x4	....	73-3200	199.0	6.00	....	N	In	L	Sil	1.51	1.32	1.37	1.18	.284	.284	.314	.312
53	Gray Six-71	M	6-3¼x4⅜	....	84-3000	218.0	6.50	....	N	In	L	Sil	1.51	1.32	1.37	1.18	.284	.284	.314	.312
54	Gray Phantom 6-90	M	6-3¼x4⅜	....	90-3600	218.0	7.00	....	N	In	L	Sil	1.51	1.32	1.37	1.18	.284	.284	.314	.312
55	Gray Phantom 6-103	M	6-3¼x4⅜	....	103-3600	218.0	7.00	....	N	In	L	Sil	1.51	1.32	1.37	1.18	.284	.284	.314	.312
56	Gray Six-91	M	6-3$\frac{7}{16}$x4⅜	....	100-3000	244.0	7.00	....	N	In	L	Sil	1.70	1.43	1.56	1.31	.375	.375	.372	.370
57	Gray Phantom 6-125	M	6-3$\frac{7}{16}$x4⅜	....	125-3600	244.0	7.00	....	N	In	L	Sil	1.70	1.43	1.56	1.31	.375	.375	.372	.370
58	Gray Fireball 6-140	M	6-3$\frac{7}{16}$x4⅜	....	140-4000	244.0	7.50	....	N	In	L	Sil	1.57	1.42	1.43	1.31	.311	.311	.339	.338
59	Gray Fireball 6-150	M	6-3$\frac{7}{16}$x4⅜	....	150-4000	244.0	7.50	....	N	In	L	Sil	1.57	1.42	1.43	1.31	.311	.311	.339	.338
60	Gray Fireball 6-160	M	6-3$\frac{7}{16}$x4⅜	....	160-4000	244.0	7.50	....	N	In	L	Sil	1.57	1.42	1.43	1.31	.311	.311	.339	.338
61	Gray Racing Fireball	M	6-3.30x4⅜	....	180-5000	225.0	10.00	....	N	In	L	Sil	1.71	1.58	1.56	1.43	.360	.360	.340	.371
62	Gray Six-101	M	6-3¾x4⅜	....	110-3200	290.0	6.50	....	N	In	L	Sil	1.78	1.51	1.62	1.37	.354	.354	.404	.402
63	Gray Six-121	M	6-4x4⅜	....	124-3200	330.0	6.50	....	N	In	L	Sil	1.76	1.51	1.62	1.37	.354	.354	.404	.402
64	Gray Super Six	M	6-4x4⅜	....	145-3200	330.0	6.50	....	N	In	L	Sil	1.76	1.51	1.62	1.37	.354	.354	.404	.402
65	Gray Six-105	M	6-4¼x4½	....	101-2400	383.0	5.50	....	N	In	L	Sil	2.06	1.87	1.81	1.62	.406	.406	.434	.432
66	Gray Eight-160	M	8-3⅝x4½	....	160-3200	372.0	6.25	....	N	In	L	Sil	1.56	1.42	1.50	1.37	.372	.372	.339	.338
67	Gray Phantom 8-175	M	8-3⅝x4½	....	175-3600	372.0	6.62	....	N	In	L	Sil	1.56	1.42	1.50	1.37	.372	.372	.339	.383
68	Hall-Scott Fisher Jr. 178-179	M	4-4¼x5½	....	75-1800	312.0	4.00	....	N	Se	I	Sil	2.13	2.13	1.93	1.93	.362	.362	.435	.435
69	Hall-Scott 95	T, B	6-4x5	115-2800	95-2600	377.0	5.40	290-1000 (BE)	W	In	I	AESW	2.03	1.91	1.87	1.65	.421	.421	.435	.435
70	Hall-Scott 130	T, B, FA	6-4¼x5	130-3000	107-2800	425.6	4.96	288-1000 (BE)	W	In	I	AESW	2.28	2.16	2.12	1.90	.421	.421	.435	.435
71	Hall-Scott 135	T, B, FA	6-4½x5	145-2800	122-2800	477.1	5.50	340-1000 (BE)	W	In	I	AESW	2.28	2.16	2.12	1.90	421	.421	.435	.435
72	Hall-Scott 180	T, B, FA	6-5x6	200-2200	170-2100	706.8	5.16	500-1400 (BE)	W	In	I	AESW	2.62	2.37	2.37	2.00	.482	.482	.497	.528
73	Hall-Scott 175-1	T, B, FA	6-5x6	204-2200	173-2000	706.8	5.00	525-1000 (BE)	N	Se	I	AESW	2.50	2.50	2.31	2.31	.406	.343	.435	.435
74	Hall-Scott 176	T, B, FA	6-5¼x6	222-2200	191-1800	779.3	5.00	580-1100 (BE)	N	Se	I	AESW	2.50	2.50	2.31	2.31	.406	.343	.435	.435
75	Hall-Scott 190	T,B,FA,RC	6-5¼x6	240-2200	200-2000	779.3	5.00	570-1200 (BE)	W	In	I	AESW	2.62	2.37	2.37	2.00	.482	.482	.497	.528
76	Hall-Scott 177	T,B,FA,Ind	6-5½x6	243-2200	203-1800	855.2	5.00	710-1100 (BE)	N	Se	I	AESW	2.50	2.50	2.31	2.31	.406	.343	.435	.435
77	Hall-Scott 400	T	6-5¾x7	286-1800	260-1800	1090.0	5.70	865-1200 (BE)	N	Se	I	2112°	2.87	2.75	2.62	2.50	.482	.482	.497	.528
78	Hall-Scott Invader 186-87	M	6-5½x7	....	252-2100	997.8	5.09	....	N	In	I	AESW	2.87	2.87	2.62	2.62	.482	.482	.497	.528
79	Hall-Scott Invader 168-69	M	6-5½x7	....	275-2100	997.8	5.09	....	N	In	I	AESW	2.87	2.87	2.62	2.62	.482	.482	.497	.528
80	Hall-Scott Defender 1268-69	M	12-5½x7	....	575-2100	1996.0	5.80	....	N	Se	I	AESW	2.87	2.75	2.62	2.50	.482	.482	.497	.528
81	Hall-Scott Defender 2286-87	M	12-5¾x7	....	605-2100	2181.0	7.00	....	N	Se	I	AESW	2.87	2.75	2.62	2.50	.482	.482	.497	.528
82	Hall-Scott Defender 2268-69	M	12-5¾x7	....	630-2100	2181.0	7.00	....	N	Se	I	AESW	2.87	2.75	2.62	2.50	.482	.482	.497	.528
83	Hall-Scott Defender ‡3368-69	M	12-5¾x7	....	900-2100	2181.0	6.00	....	N	Se	I	AESW	2.87	2.75	2.62	2.50	.482	.482	.497	.528
84	Hercules BXB	M, Tr, Ind	2-2⅞x3	10-2300	8-2300	39.0	6.00	28-1250 (BE)	N	In	L	AUS	1.30	1.05	1.12	.875	.200	.200	.248	.248
85	Hercules NXA	M, Tr, Ind	2-3x4	13-2000	11-2000	56.5	5.50	39-1100 (BE)	N	In	L	AUS	1.30	1.05	1.12	1.12	.250	.250	.312	.312
86	Hercules NXB	M, Tr, Ind	2-3¼x4	16-2000	13-2000	66.3	5.50	46-1100 (BE)	N	In	L	AUS	1.30	1.05	1.12	1.12	.250	.250	.312	.312
87	Hercules ZXB	T,Tr,M,Ind	4-2⅝x3	25-3800	21-3800	64.9	6.10	40-2000 (BE)	N	In	L	AUS	1.30	1.05	1.12	.875	.200	.200	.248	.248
88	Hercules IXA-3, IXA-5	T,Tr,M,Ind	4-3x4	40-3200	34-3200	113.0	5.50	79-2000 (BE)	N	In	L	AUS	1.48	1.35	1.25	1.12	.250	.250	.310	.310
89	Hercules IXK-3	T,Tr,M,Ind	4-3⅛x4	43-3200	37-3200	122.9	5.50	86-2000 (BE)	N	In	L	AUS	1.48	1.35	1.25	1.12	.250	.250	.310	.310
90	Hercules IXB-3, IXB-5	T,Tr,M,Ind	4-3¼x4	47-3200	40-3200	133.0	5.20	92-2000 (BE)	N	In	L	AUS	1.48	1.35	1.25	1.12	.250	.250	.310	.310
91	Hercules JXA	T,B,Tr,M,Ind	6-3⅜x4¼	63-2800	53-2800	228.0	5.16	141-1000 (BE)	N	In	L	AUS	1.75	1.62	1.50	1.37	.322	.322	.373	.373
92	Hercules JXC	T,B,Tr,M,Ind	6-3¾x4¼	87-3000	74-3000	282.0	5.90	215-1000 (BE)	N	In	L	AUS	1.75	1.62	1.50	1.37	.356	.356	.373	.373
93	Hercules JXD	T,B,Tr,M,Ind	6-4x4¼	110-3000	93-3000	320.0	6.50	243-1200 (BE)	N	In	L	AUS	1.75	1.62	1.50	1.37	.356	.356	.373	.373
94	Hercules WXLC	T,B,Tr,M,Ind	6-4x4¾	111-2800	94-2800	358.0	6.29	268-1100 (BE)	N	In	L	AUS	1.75	1.75	1.62	1.50	.388	.388	.373	.373
95	Hercules WXLC-3	T,B,Tr,M,Ind	6-4¼x4¾	126-2800	107-2800	404.0	6.29	302-1000 (BE)	N	In	L	AUS	1.75	1.75	1.62	1.50	.388	.388	.373	.373

(For abbreviations see pages 120-121)

Engines—*Continued*

Valves: Exhaust (partly cut off)	Valves: Seats: Angle (Deg.)	Valves: Seats: Inserts Used?	Valves: Seats: Insert Material (S.A.E. No.)	Camshaft Drive—Type	Pistons: Material	Pistons: Weight with Pins, Rings, Bushings (Oz.)	Pistons: Piston Pin—Diameter and Length (In.)	Number of Rings per Piston	Connecting Rods: Material	Connecting Rods: Center to Center Length (In.)	Connecting Rods: Weight with Bushing and Cap (Oz.)	Crankshaft: Material	Crankshaft: Counter Balance Used	Crankshaft: Crank-Pin Diameter and Length (In.)	Crankshaft: Main Bearings: Number	Crankshaft: Main Bearings: Diameter and Length (In.): Front	Crankshaft: Main Bearings: Diameter and Length (In.): Rear	Oil Pressure to—	Spark Plug—Thread Size	Carburetor: Make	Carburetor: Size	Engine Weight without Carburetor or Ignition (Lb.)	Overall Dimensions (In.): Width	Overall Dimensions (In.): Height	Overall Dimensions (In.): Length	Line Number
.562	45	E	CI	HG	CI	189	1.48x5.25	4	1035	14	194	1045	N	3.00x3.00	3	3.25x3.50	3.25x4.75	abceg	7/8-18	Zen	1 3/4	1800	30 1/2	46	53 1/4	1
.562	45	E	CI	HG	Al	153	1.49x5.37	4	3135	16	244	4140	N	3.00x3.50	3	3.25x3.81	3.25x4.50	abceg	7/8-18	Zen	2	2300	31 3/16	49 1/2	57 5/16	2
.625	45	N	......	HG	CI	210	1.49x5.37	4	3135	16	244	4140	Y	3.00x3.50	4	3.25x3.81	3.25x4.50	abce	7/8-18	Zen	2	2660	29 1/2	46 3/16	73 13/16	3
.562	45	E	CI	HG	Al	153	1.49x5.37	4	3135	16	244	4140	Y	3.00x3.50	4	3.25x3.81	3.25x4.50	abceg	7/8-18	Zen(2)	1 3/4	3200	29 1/2	51 3/8	73 13/16	4
.562	45	E	CI	HG	Al	153	1.49x5.37	4	3135	16	244	4140	N	3.37x3.18	5	4.00x3.62	4.00x4.50	abceg	7/8-18	Zen(2)	2	4500	35 5/16	56 13/16	97 7/16	5
.313	(h)	N	......	HG	CT	.....	.703x2.06	3	1030	5 3/4	.....	1045	N	1.50x1.18	3	1.75x1.37	1.75x1.78	abcet	18 mm	......	7/8	298	26	22 15/16	25 1/2	6
.313	(h)	N	......	HG	CT	.....	.703x2.44	3	1030	5 3/4	.....	1045	N	1.50x1.18	3	1.75x1.37	1.75x1.78	abcet	18 mm	......	7/8	305	26	22 15/16	25 1/2	7
.313	(h)	N	......	HG	CT	.....	.703x2.75	3	1030	5 3/4	.....	1045	N	1.50x1.18	3	1.75x1.28	1.75x1.65	abcet	18 mm	......	1	315	26	22 1/8	25 1/2	8
.339	(h)	E	WA	HG	CT	.....	.859x2.50	4	1030	7	.....	1045	N	1.93x1.31	3	2.25x1.18	2.25x1.89	abcet	18 mm	......	1 1/4	400	26	26 11/32	29 7/16	9
.339	(h)	E	WA	HG	CT	.....	.859x2.68	4	1030	7	.....	1045	N	1.93x1.31	3	2.25x1.18	2.25x1.89	abcet	18 mm	......	1 1/4	405	26	26 11/32	29 7/16	10
.339	(h)	E	WA	HG	CT	.....	.859x2.87	4	1030	7	.....	1045	N	1.93x1.31	3	2.25x1.18	2.25x1.89	abcet	18 mm	......	1 1/4	410	26	26 11/32	29 7/16	11
.339	(h)	E	WA	Ch	CT	.....	.859x2.50	4	1030	7	.....	1045	Y	1.93x1.31	4	2.25x1.18	2.25x1.81	abcet	18 mm	......	1 1/4	481	26	27 1/4	36 11/32	12
.339	(h)	E	WA	Ch	CT	.....	.859x2.62	4	1030	7	.....	1045	Y	1.93x1.31	4	2.25x1.21	2.25x1.81	abcet	18 mm	......	1 1/4	506	26	27 1/4	36 11/32	13
.339	(h)	E	WA	Ch	CT	.....	.859x2.62	4	1030	7	.....	1045	Y	2.06x1.31	4	2.37x1.28	2.37x1.73	abcet	18 mm	......	1 1/4	512	26	27 1/4	36 11/32	14
.372	(h)	E	Tun	HG	Al	.....	.859x2.87	5	1035	8 3/8	.....	1045	Y	2.12x1.37	4	2.37x1.43	2.37x2.06	abcet	18 mm	......	1 1/4	548	26	28 37/64	38 11/32	15
.402	(h)	E	WA	HG	CT	.....	1.10x3.06	4	1035	8 3/8	.....	1045	Y	2.25x1.56	7	2.62x1.56	2.62x2.18	abcet	18 mm	......	1 1/2	750	25 3/4	29 1/2	42	16
.402	(h)	E	WA	HG	CT	.....	1.10x3.18	4	1035	8 3/8	.....	1045	Y	2.25x1.56	7	2.62x1.56	2.62x2.18	abcet	18 mm	......	1 1/2	760	25 3/4	29 1/2	42	17
.402	(h)	E	WA	HG	CT	.....	1.10x3.43	4	1035	8 3/8	.....	1045	Y	2.25x1.56	7	2.62x1.56	2.62x2.18	abcet	18 mm	......	1 1/2	770	25 3/4	29 1/2	42	18
.432	(h)	E	HS	HG	Al	.....	1.25x3.43	5	1035	8 3/8	.....	1045	Y	2.50x1.69	7	2.87x1.65	2.87x2.72	abcet	18 mm	......	1 3/4	855	26	29 1/4	43 11/32	19
.432	(h)	E	HS	HG	Al	.....	1.25x3.43	5	1035	8 3/8	.....	1045	Y	2.50x1.69	7	2.87x1.65	2.87x2.72	abcet	18 mm	......	1 3/4	870	26	29 1/4	43 11/32	20
.433	30	E	HS	Ch	Al	.....	1.25x3.68	4	1035	9 1/2	.....	4140	N	2.50x1.81	7	2.75x1.75	2.75x2.81	abcefg	18 mm	......	1 3/4	1318	25 3/4	36 25/32	46 31/32	21
.433	(h)	E	HS	Ch	Al	.....	1.50x3.71	4	1035	10 1/2	.....	4140	Y	2.75x1.81	7	2.75x1.75	2.75x2.81	abcefg	18 mm	......	2	1430	25 3/4	39 5/8	43 31/32	22
.495	(h)	E	Tun	HG	Al	.....	1.50x3.72	5	1035	10 1/2	.....	1045	Y	3.00x1.94	7	3.25x1.75	3.25x2.75	abcegt	18 mm	......	2	1250	29	43 11/32	51 9/32	23
.495	(h)	E	Tun	HG	Al	.....	1.50x3.72	5	1035	10 1/2	.....	1045	Y	3.00x1.94	7	3.25x1.75	3.25x2.75	abcegt	18 mm	......	2	1250	29	43 11/32	51 9/32	24
.432	(h)	E	Tun	HG	Al	.....	1.25x3.43	5	1035	8 3/8	.....	1045	Y	2.50x1.69	7	2.87x1.65	2.87x2.71	abcegt	18 mm	......	1 3/4	885	26	29 1/4	43 11/32	25
.310	45	Bo	CM	HG	CAS	20	.750x .	4	MS	6 1/8	20	CAS	Y	2.10x1.12	3	2.25x1.60	2.25x1.60	abc	14 mm	Own	.78	352	......	......	......	26
.310	45	Bo	CM	HG	CAS	21	.850x2.92	3	MS	7 1/16	26	CAS	Y	2.23x1.40	4	2.50x1.15	2.50x1.50	abc	14 mm	Own	1.19	532	......	......	......	27
.310	45	Bo	CM	HG	CAS	18	.750x .	4	MS	7	17	CAS	Y	2.00x1.75	3	2.50x1.50	2.50x2.00	abc	14 mm	Own	.94	547	......	......	......	28
.310	45	Bo	CM	HG	CAS	20	.750x .	4	MS	7	17	CAS	Y	2.14x1.75	3	2.50x1.50	2.50x2.00	abc	14 mm	Own	.94	554	......	......	......	29
.343	30	E	WR	HG	Al	33	.990x3.08	4	1040-A	7	33	1050	Y	2.31x1.23	4	2.69x1.19	2.78x1.47	abcdeg	14 mm	Zen	1 3/8	......	21 13/32	26 1/16	40 3/4	30
.343	30	E	WR	HG	Al	34	.990x3.25	4	1040-A	7	33	1050	Y	2.31x1.23	4	2.69x1.19	2.78x1.47	abcdeg	14 mm	Zen	1 3/8	......	21 13/32	26 1/16	40 3/4	31
.343	30	E	WR	HG	Al	34	.990x3.25	4	1040-A	7	33	1050	Y	2.31x1.23	4	2.69x1.19	2.78x1.47	abcdeg	14 mm	Zen	1 3/8	......	21 13/32	26 1/16	40 3/4	32
.375	(h)	E	WR	HG	Al	37	1.00x3.18	4	1040-A	9 3/4	51	1050	Y	2.37x1.34	7	2.75x2.09	2.75x2.09	abcdeg	14 mm	Zen	1 3/8	......	25 1/4	31 19/64	45 1/32	33
.375	45	E	WR	HG	Al	40	1.00x3.36	4	1040-A	9 3/4	51	1050	Y	2.37x1.34	7	2.75x2.09	2.75x2.09	abcdeg	14 mm	Zen	1 3/8	......	25 1/4	31 19/64	45 1/32	34
.375	(h)	E	St	HG	Al	59	1.25x3.59	4	1040-A	10 3/4	73	1050	Y	2.62x1.47	7	3.00x2.22	3.00x2.22	abcdeg	14 mm	Zen	1 1/2	......	22 1/2	35 1/16	47 1/16	35
.375	(h)	E	St	HG	Al	60	1.25x3.71	4	1040-A	10 3/4	73	1050	Y	2.62x1.47	7	3.00x2.22	3.00x2.22	abcdeg	14 mm	Zen	1 1/2	......	22 1/2	35 1/16	47 1/16	36
.375	(h)	E	St	HG	Al	63	1.25x3.84	4	1040-A	10 3/4	73	1050	Y	2.62x1.47	7	3.00x2.22	3.00x2.22	abcdeg	14 mm	Zen	1 3/4	......	22 1/2	35 1/16	47 1/16	37
.375	(h)	E	St	HG	Al	64	1.25x3.96	4	1040-A	10 3/4	.....	1050	Y	2.62x1.75	7	3.00x2.22	3.00x2.22	abcdeg	14 mm	Zen	1 3/4	......	22 1/2	35 1/16	47 1/16	38
.437	30	E	St	HG	Al	66	1.25x4.06	4	1040-A	10 1/2	82	1050	Y	2.62x1.72	7	3.50x2.50	3.50x2.50	abcdeg	14 mm	Zen	2	......	27	47	50	39
.500	30	E	St	HG	Al	77	1.37x4.47	5	4140-A	12 1/8	77	4140	Y	2.75x2.06	7	3.00x1.72	3.00x2.50	abcdeg	18 mm	Str	2	......	29 1/2	50	62 1/2	40
.312	(h)	N	......	HG	CI	16	.703x2.06	3	CS	5 3/4	17	1045	N	1.50x1.18	3	1.75x1.78	1.75x1.37	abce	14 mm	Zen	3/4	330	16 1/4	17 1/2	30	41
.312	(h)	N	......	HG	CI	21	.703x2.43	3	CS	5 3/4	17	1045	N	1.50x1.18	3	1.75x1.78	1.75x1.37	abce	14 mm	Zen	1	375	15	18 5/8	30 5/8	42
.312	(h)	N	......	HG	Al	16	.703x2.43	3	CS	5 3/4	17	1045	N	1.50x1.18	3	1.75x1.78	1.75x1.37	abce	14 mm	Zen	1 3/8	340	17 3/8	18 1/2	30	43
.312	(h)	N	......	HG	Al	16	.703x2.43	3	CS	5 3/4	17	1045	N	1.50x1.18	3	1.75x1.78	1.75x1.37	abce	14 mm	Zen	1	265	21 3/8	22 7/16	24 1/2	44
.312	(h)	N	......	HG	Al	16	.703x2.43	3	CS	5 3/4	17	1045	N	1.50x1.18	3	1.75x1.78	1.75x1.37	abce	14 mm	Zen	1	260	21 3/8	22 7/16	24 1/2	45
.312	(h)	N	......	HG	CI	25	.709x2.68	3	CS	5 3/4	17	1045	N	1.50x1.18	3	1.75x1.66	1.75x1.28	abce	14 mm	Zen	1	410	15	18 5/8	31 5/8	46
.338	(h)	N	......	HG	Al	20	.859x2.68	4	CS	7	32	1045	N	1.93x1.31	3	2.25x1.89	2.25x1.18	abce	18 mm	Zen	1 1/4	510	18 7/16	23 1/2	35 1/8	47
.338	(h)	N	......	HG	Al	20	.859x2.68	4	CS	7	32	1045	N	1.93x1.31	3	2.25x1.89	2.25x1.18	abce	18 mm	Zen	1 1/4	435	20 1/4	21 7/8	33	48
.338	(h)	N	......	HG	Al	24	.859x2.68	4	CS	7	32	1045	N	1.93x1.31	3	2.25x1.89	2.25x1.18	abce	18 mm	Zen	1 1/4	540	18 7/16	23 1/2	35 1/8	49
.338	(h)	N	......	HG	Al	24	.859x2.68	4	CS	7	32	1045	N	1.93x1.31	3	2.25x1.89	2.25x1.18	abce	18 mm	Zen	1 1/4	460	20 1/4	21 7/8	33	50
.338	(h)	N	......	HG	Al	24	.859x2.68	4	CS	7	32	1045	N	1.93x1.31	3	2.25x1.89	2.25x1.18	abce	18 mm	Zen	1 1/4	465	22 3/4	27 3/4	33	51
.312	(h)	N	......	HG	CI	29	.859x2.68	4	CS	7	32	1045	Y	1.93x1.31	4	2.25x1.81	2.25x1.21	abce	18 mm	Zen	1 1/4	650	18 1/2	23	41	52
.312	(h)	N	......	HG	CI	31	.859x2.68	4	CS	7	32	1045	Y	1.93x1.31	4	2.25x1.81	2.25x1.21	abce	18 mm	Zen	1 1/2	665	18 1/2	23	42	53
.312	(h)	N	......	HG	Al	20	.859x2.68	4	CS	7	32	1045	Y	1.93x1.31	4	2.25x1.81	2.25x1.21	abce	18 mm	Zen	1 1/2	625	23	22	39 7/8	54
.312	(h)	N	......	HG	Al	20	.859x2.68	4	CS	7	32	1045	Y	1.93x1.31	4	2.25x1.81	2.25x1.21	abce	18 mm	Zen	1 1/4	630	23	22	39 7/8	55
.370	45	N	......	HG	Al	28	.859x2.87	4	CS	8 3/8	34	1045	Y	2.12x1.37	5	2.37x2.06	2.37x1.43	abce	18 mm	Zen	1 3/4	795	22	26 1/8	43 3/8	56
.370	45	N	......	HG	Al	28	.859x2.87	4	CS	8 3/8	34	1045	Y	2.12x1.37	5	2.37x2.06	2.37x1.43	abce	18 mm	Zen	1 3/4	750	24 1/2	25 1/2	42 7/8	57
.338	(h)	N	......	HG	Al	28	.859x2.87	4	CS	8 3/8	34	1045	Y	2.12x1.37	4	2.37x2.06	2.37x1.43	abce	18 mm	Str	1 1/2	730	22 1/2	30	42 3/4	58
.338	(h)	N	......	HG	Al	28	.859x2.87	4	CS	8 3/8	34	1045	Y	2.12x1.37	4	2.37x2.06	2.37x1.43	abce	18 mm	Str	1 1/2	730	22 1/2	30	42 3/4	59
.338	(h)	N	......	HG	Al	28	.859x2.87	4	CS	8 3/8	34	1045	Y	2.12x1.37	4	2.37x2.06	2.37x1.43	abce	18 mm	Zen	1 1/2	730	30 3/4	32 1/2	42 3/4	60
.371	45	N	......	HG	Al	25	.874x2.92	4	CS	8 3/8	32	1045	Y	2.12x1.37	4	2.39x1.91	2.39x1.50	abce	18 mm	Zen	1 1/2	595	28 3/8	23	38 7/8	61
.402	(h)	N	......	HG	Al	40	1.10x3.18	4	CS	8 3/8	47	1045	Y	2.25x1.56	7	2.62x2.15	2.62x1.56	abce	18 mm	Str	1 1/2	985	23 15/16	26	49 5/8	62
.402	(h)	N	......	HG	Al	45	1.10x3.43	4	CS	8 3/8	47	1045	Y	2.25x1.56	7	2.62x2.15	2.62x1.56	abce	18 mm	Str	1 3/4	1015	23 15/16	26	49 5/8	63
.402	(h)	N	......	HG	Al	45	1.10x3.43	4	CS	8 3/8	47	1045	Y	2.25x1.56	7	2.62x2.15	2.62x1.56	abce	18 mm	Str	1 1/2	990	23 15/16	26	49	64
.432	30	E	HS	HG	CI	74	1.25x3.43	4	CS	9	60	1045	Y	2.37x1.81	7	2.62x2.65	2.62x1.65	abce	18 mm	Str	1 1/2	1250	22	29 1/8	55 5/8	65
.338	(h)	N	......	HG	Al	30	1.11x3.05	4	CS	9	49	1045	Y	2.25x1.50	5	2.62x2.53	2.62x1.65	abce	18 mm	Str	1 1/2	1275	25 3/4	28	59 1/2	66
.383	(h)	N	......	HG	Al	30	1.11x3.05	4	CS	9	49	1045	Y	2.25x1.50	5	2.62x2.53	2.62x1.65	abce	18 mm	Str	1 1/2	1250	25 3/4	28	54 7/8	67
.435	45	N	......	HC	Al	57	1.25x3.75	6	AS	11	104	4140	N	2.25x2.45	3	2.75x2.31	2.75x2.31	abcefg	18 mm	Zen	1 1/2	††	24 5/8	(6)	(7)	68
.435	30	E	CA	Ch	Al	40	1.25x3.50	5	AS	11	90	4140	Y	2.62x2.00	7	3.00x1.50	3.00x2.25	abcefg	18 mm	Zen	1 1/2	1235*	54 3/4	18 1/16	52 7/8	69
.435	30	E	CA	Ch	Al	52	1.12x3.74	4	AS	11	104	4140	Y	2.62x2.00	7	3.00x1.50	3.00x2.25	abcefg	18 mm	Zen	1 3/4	1252*	54 3/4	18 7/16	52 7/8	70
.435	30	E	CA	Ch	Al	56	1.12x3.98	4	AS	11	104	4140	Y	2.62x2.00	7	3.00x1.50	3.00x2.25	abcefg	18 mm	Zen	1 3/4	1265*	54 3/4	18 7/16	52 7/8	71
.528	30	E	CA	Ch	Al	77	1.37x4.20	5	AS	11	119	4140	Y	2.75x2.45	7	3.00x2.18	3.25x2.56	abcefg	18 mm	Zen	2	1960*	53 1/16	20 11/16	69 3/8	72
.435	(h)	E	CA	HC	Al	97	1.37x4.20	4	AS	11	117	4140	Y	2.50x2.45	7	3.25x1.56	3.25x2.56	abcefg	18 mm	Zen(2)	2	1975*	28 3/16	41 7/16	59 7/8	73
.435	(h)	E	CA	HC	Al	104	1.37x4.43	5	AS	11	117	4140	Y	2.50x2.45	7	3.25x1.56	3.25x2.56	abcefg	18 mm	Zen(2)	2	2020*	28 3/16	41 7/16	59 7/8	74
.528	30	E	CA	HC	Al	104	1.37x4.43	5	AS	11	119	4140	Y	2.75x2.45	7	3.25x2.18	3.25x2.56	abcefg	18 mm	Zen(2)	1 3/4	2035*	53 1/2	22 1/4	69 3/8	75
.435	(h)	E	CA	HC	Al	114	1.37x4.68	5	AS	11	117	4140	Y	2.50x2.45	7	3.25x1.56	3.25x2.56	abcefg	18 mm	Zen(2)	2	2050*	28 3/16	41 7/16	59 7/8	76
.528	(h)	E	4140°	HC	Al	120	1.37x4.93	6	3140	12	157	4140	Y	3.00x2.43	7	3.25x2.09	3.25x3.12	abceg	18 mm	Zen	2 1/2	1950*	28	44 5/8	59 1/8	77
.528	30	N	......	Ch	Al	108	1.37x4.68	5	AS	11	117	4140	Y	2.50x2.45	7	2.75x1.94	2.75x1.94	abcefg	18 mm	Zen(2)	2	3265*	25	47 1/8	90 1/2	78
.528	30	N	......	Ch	Al	108	1.37x4.68	5	AS	11	117	4140	Y	2.50x2.45	7	2.75x1.94	2.75x1.94	abcefgr	18 mm	Zen(2)	2	2200*	25	39 5/8	74 3/16	79
.528	30	E	CA	HC	Al	101	1.37x4.68	6	3140	12	237♦	4140	Y	3.00x2.43	7	3.25x2.09	3.25x3.09	abcefgr	18 mm	Zen(3)	2 1/2	3650*	45	42 3/4	88	80
.528	30	E	CA	HC	Al	128	1.37x4.94	6	3140	12	237♦	4140	Y	3.00x2.43	7	3.25x2.09	3.25x2.09	abcefgr	18 mm	Zen(3)	2 1/2	4560*	43 3/4	50 1/4	108 1/16	81
.528	30	E	CA	HC	Al	128	1.37x4.94	6	3140	12	237♦	4140	Y	3.00x2.43	7	3.25x2.09	3.25x2.09	abcefgr	18 mm	Zen(3)	2 1/2	3650*	45	42 3/4	88	82
.528	30	E	CA	HC	Al	123	1.37x4.94	6	3140	12	237♦	4140	Y	3.00x2.43	7	3.25x2.09	3.25x2.09	abcefgr	18 mm	Zen(4)	2 1/2	4105*	43 3/4	56 1/4	91 7/16	83
.248	30	N	......	HG	CI	17	.687x2.50	3	3140	5 1/8	15	1045	Y	1.50x1.00	2	2.00x1.25	2.00x1.37	abe	14 mm	Op	5/8	131	14 7/8	16 1/4	18 13/16	84
.312	30	N	......	HG	CI	28	.750x2.56	3	3140	6 9/16	21	4140	Y	1.75x1.12	2	2.00x1.56	2.00x1.62	abe	7/8-18	Op	Op	270	15 1/4	18 1/2	18 5/8	85
.312	30	N	......	HG	CI	29	.750x2.81	3	3140	6 9/16	21	4140	Y	1.75x1.12	2	2.00x1.56	2.00x1.62	abe	7/8-18	Op	Op	270	15 1/4	18 1/2	18 5/8	86
.248	30	N	......	HG	CI	19	.687x2.31	3	3140	5 1/8	15	4140	N	1.50x1.00	3	2.00x1.31	2.00x1.37	abe	14 mm	Op	Op	179	14 3/4	16 9/16	21 5/16	87
.310	30	N	......	HG	CI	28	.750x2.56	3	3140	6 9/16	21	1045	N	1.75x1.12	3	2.00x1.56	2.00x1.62	abe	7/8-18	Op	Op	285	16 5/8	18 3/4	24 3/16	88
.310	30	N	......	HG	CI	29	.750x2.56	3	3140	6 9/16	21	1045	N	1.75x1.12	3	2.00x1.56	2.00x1.62	abe	7/8-18	Op	Op	280	16 5/8	18 3/4	24 3/16	89
.310	30	N	......	HG	CI	29	.750x2.81	3	3140	6 9/16	21	1045	N	1.75x1.12	3	2.00x1.56	2.00x1.62	abe	7/8-18	Op	Op	293	16 5/8	18 3/4	24 3/16	90
.373	45	N	......	HG	CI	43	1.00x2.90	4	1035	8	37	CS‡	Op	2.00x1.50	7	2.50x1.31	2.50x2.12	abe	7/8-18	Op	1 1/4	550	17 5/8	23 1/2	37 3/8	91
.373	45	N	......	HG	Al	37	1.00x3.37	4	1035	8	37	CS‡	Op	2.00x1.50	7	2.50x1.31	2.50x2.12	abe	7/8-18	Op	1 1/4	565	17 5/8	23 1/2	37 3/8	92
.373	45	N	......	HG	Al	40	1.00x3.51	4	1035	8	37	CS‡	Op	2.00x1.50	7	2.50x1.31	2.50x2.12	abe	7/8-18	Op	1 3/4	570	17 5/8	23 1/2	37 3/8	93
.373	45	N	......	HG	Al	47	1.12x3.56	4	3140	8 7/8	50	CS‡	Y	2.25x1.50	7	2.62x1.75	2.75x2.75	abe	7/8-18	Op	1 3/4	811	21	27	41 11/16	94
.373	45	N	......	HG	Al	55	1.12x3.68	4	3140	8 7/8	50	CS‡	Y	2.25x1.50	7	2.62x1.75	2.75x2.75	abe	7/8-18	Op	1 3/4	825	21	27	41 11/16	95

(For abbreviations see pages 120-121)

American Gasoline

Line Number	Engine Make and Model	Designed for	Number of Cylinders, Bore and Stroke (In.)	Maximum Brake Hp. at Specified R.P.M.: With Bare Engine	Maximum Brake Hp. at Specified R.P.M.: With Standard Accessories	Piston Displacement (Cu. In.)	Compression Ratio	Maximum Torque at R.P.M. (Lb. Ft.) with or without Accessories	Cylinder Liners—Type	Crankcase—Upper Half Integral with Cylinders	Valves: Arrangement	Valves: Exhaust Head Material (S.A.E. No.)	Valves: Max. Head Diameter (In.): Intake	Valves: Max. Head Diameter (In.): Exhaust	Valves: Min. Port Diameter (In.): Intake	Valves: Min. Port Diameter (In.): Exhaust	Valves: Lift (In.): Intake	Valves: Lift (In.): Exhaust	Valves: Stem Diameter (In.): Intake	Valves: Stem Diameter (In.): Exhaust
1	Hercules....RXB	T,B,Tr,M,Ind	6-4½x5¼	121-2400	103-2400	500.9	5.41	362-1100 (BE)	N	In	L	Sil	2.00	2.00	1.75	1.75	.388	.388	.373	.373
2	Hercules....RXC	T,B,Tr,M,Ind	6-4⅝x5¼	131-2400	111-2400	529.2	5.41	395-1000 (BE)	N	In	L	Sil	2.00	2.00	1.75	1.75	.388	.388	.373	.373
3	Hercules....RXLC	T,B,Tr,M,Ind	6-4⅝x5¼	144-2400	122-2400	529.2	6.20	413-1000 (BE)	N	In	L	AUS	2.00	2.00	1.75	1.75	.388	.388	.373	.373
4	Hercules....RXLD	T,B,Tr,M,Ind	6-4¾x5¼	152-2400	129-2400	558.0	6.20	438-1000 (BE)	N	In	L	AUS	2.00	2.00	1.81	1.75	.388	.388	.373	.373
5	Hercules....HXB	T,B,Tr,M,Ind	6-5x6	160-2100	136-2100	707.0	5.75	502-900 (BE)	N	Se	L	Sil	2.43	2.31	2.12	2.00	.468	.468	.498	.498
6	Hercules....HXC	T,B,Tr,M,Ind	6-5¼x6	177-2100	150-2100	779.0	5.69	550-1000 (BE)	N	Se	L	Sil	2.43	2.31	2.12	2.00	.468	.468	.498	.498
7	Hercules....HXD	T,B,Tr,M,Ind	6-5½x6	184-1800	156-1800	855.0	5.73	630-900 (BE)	N	Se	L	Sil	2.43	2.31	2.12	2.00	.468	.468	.498	.498
8	Hercules....HXE	T,B,Tr,M,Ind	6-5¾x6	200-1800	170-1800	935.0	5.50	695-900 (BE)	N	Se	L	Sil	2.43	2.31	2.12	2.00	.468	.468	.498	.498
9	Hudson....20-C	C, T	6-3x4⅛	....	92-4000	175.0	7.25	138-1400 (EA)	N	In	L	Sil	1.37	1.37	1.26	1.23	.343	.343	.341	.339
10	International....U-2	Tr,Ind	4-3x4	24-1800	22-1800	113.1	5.23	78-1000 (EA)	W	In	I	CNS	1.34	1.21	1.18	1.06	.261	.261	.341	.341
11	International....U-4	Tr,Ind	4-3⅜x4¼	33-1800	31-1800	152.1	5.90	108-1250 (EA)	D	In	I	CNS	1.50	1.37	1.34	1.21	.343	.343	.341	.341
12	International....U-6	Tr,Ind	4-3⅞x5¼	42-1500	41-1500	247.7	5.65	162-900 (EA)	D	In	I	CNS	1.81	1.65	1.59	1.43	.438	.438	.371	.371
13	International....U-9	Tr,Ind	4-4.4x5½	55.5-1500	54.5-1500	334.5	5.40	228-1000 (EA)	D	In	I	CNS	2.09	1.91	1.87	1.69	.469	.469	.402	.402
14	International....U-21	Tr,Ind	6-3¾x4½	....	66-1800	298.2	5.72	200-1200 (EA)	W	In	I	Sil	1.87	1.75	1.62	1.50	.343	.343	.372	.372
15	International....PA-100	Tr,Ind	6-5x5½	117-1400	110-1400	648.0	5.30	447-700 (EA)	W	In	I	Sil	2.37	2.37	2.12	2.12	.437	.437	....	....
16	Kermath....ZX	M	4-2⅝x3	....	25-3400	65.0	6.00	40-1700 (EA)	N	In	L	Sil	1.25	1.12	1.12	.875	.250	.250	.310	.310
17	Kermath....IXH	M	4-3¼x4	....	60-3600	134.0	5.50	97-2200 (EA)	N	In	L	Sil	1.48	1.35	1.25	1.12	.250	.250	.310	.310
18	Kermath....KWF	M	4-3⅛x4⅜	....	40-2700	134.0	6.48	106-2200 (EA)	N	In	L	.....	1.53	1.46	1.34	1.28	.359	.359	.373	.373
19	Kermath....KWHS	M	4-3⅛x4⅜	....	61-3600	134.0	6.48	106-2200 (EA)	N	In	L	.....	1.53	1.46	1.34	1.28	.359	.359	.373	.373
20	Kermath....KWSS	M	4-3⅛x4⅜	....	68-3800	134.0	6.48	106-2200 (EA)	N	In	L	.....	1.53	1.46	1.34	1.28	.359	.353	.373	.373
21	Kermath....P-841	M	6-3¼x3¾	....	110-3600	187.0	7.00	....	N	In	L	Sil	1.47	1.34	1.31	1.18	.296	.296	.312	.312
22	Kermath....QXC	M	6-3⅜x4⅛	....	95-3600	221.0	6.50	....	N	In	L	Sil	1.87	1.87	1.81	1.81	.281	.281	.310	.310
23	Kermath....P-640	M	6-3 9/16x4	....	103-3600	239.0	7.20	....	N	In	L	Sil	1.59	1.47	1.37	1.31	.296	.296	.312	.312
24	Kermath....JXD	M	6-4x4¼	....	122-3000	320.0	6.90	235-2000 (EA)	N	In	L	CNS	1.84	1.62	1.62	1.37	.376	.376	.373	.373
25	Kermath....WXC	M	6-4¼x4½	....	115-2600	383.0	5.80	265-1000 (EA)	N	In	L	Sil	1.87	1.75	1.62	1.50	.356	.356	.373	.373
26	Kermath....WXL	M	6-4¼x4¾	....	155-3000	404.0	6.50	....	N	In	L	CNS	2.06	1.87	1.81	1.62	.500	.500	.373	.373
27	Kermath....D	M	6-4⅜x5¾	....	150-2500	520.0	5.70	350-1000 (EA)	N	Se	L	CNS	2.50	2.25	2.28	2.00	.437	.375	.437	.375
28	Kermath....L	M	6-5x5¾	....	157-2000	678.0	5.30	482-1000(EA)	N	Se	L	CNS	2.56	2.37	2.37	2.12	.375	.375	.437	.437
29	Kermath....LA	M	6-5x5¾	....	200-2400	678.0	5.70	480-1000 (EA)	N	Se	L	CNS	2.62	2.37	2.40	2.00	.437	.375	.437	.437
30	Kermath....R	M	6-5x5¾	....	225-2400	678.0	5.70	540-1700 (EA)	N	Se	I	CNS	1.93	1.93	1.76	1.76	.375	.375	.375	.375
31	Kermath....VF	M	8-3 1/16x3¾	....	85-3800	221.0	6.30	150-2000 (EA)	....	In	L	Sil	1.53	1.53	.....	.....	.292	.292	.310	.310
32	Kermath....VM	M	8-3 3/16x3¾	....	95-3600	239.0	6.15	170-2100 (EA)	....	In	L	CNS	1.53	1.53	.....	.....	.292	.292	.311	.311
33	Kermath....P-836	M	8-3¼x3½	....	100-3600	232.0	7.00	175-1600 (EA)	N	In	L	Sil	1.37	1.34	1.25	1.19	.328	.328	.312	.312
34	Kermath....VZ	M	12-2⅞x3¾	....	120-3500	292.0	.....	....	....	In	L	CNS	1.53	1.53	.....	.....	.292	.292	.311	.311
35	Kermath....V	M	12-5x6	....	500-2400	1414.0	5.70	1070-1400 (EA)	N	Se	I	CNS	1.93	1.93	1.76	1.76	.375	.375	.437	.437
36	Lathrop....Standard	M	2-5 3/16x6½	....	16-600	274.7	.....	140-525 (EA)	N	Se	T	CNS	2.25	2.25	2.00	2.00	.375	.375	.437	.437
37	Lathrop....Standard	M	2-5½x6½	....	20-700	308.8	.....	163-525 (EA)	N	Se	T	CNS	2.25	2.25	2.00	2.00	.375	.375	.437	.437
38	Lathrop....Standard	M	3-5 3/16x6½	....	27-700	412.1	.....	206-600 (EA)	N	Se	T	CNS	2.25	2.25	2.00	2.00	.375	.375	.437	.437
39	Lathrop....Standard	M	3-5½x6½	....	34-800	463.2	.....	237-700 (EA)	N	Se	T	CNS	2.25	2.25	2.00	2.00	.375	.375	.437	.437
40	Lathrop....LH	M	4-3¼x4	....	38-2200	133.0	.....	92-2000 (EA)	N	In	L	CNS	.....	.....	1.25	1.12	.312	.312	.312	.312
41	Lathrop....Standard	M	4-5 3/16x6½	....	29-700	549.5	.....	233-500 (EA)	N	Se	T	CNS	2.25	2.25	2.00	2.00	.375	.375	.437	.437
42	Lathrop....Standard	M	4-5½x6½	....	49-800	617.7	.....	342-600 (EA)	N	Se	T	CNS	2.25	2.25	2.00	2.00	.375	.375	.437	.437
43	Lathrop....Engineers	M	4-5½x7	....	64-1000	665.2	.....	373-650 (EA)	N	Se	L	CNS	2.68	2.50	2.31	2.12	.375	.375	.500	.500
44	Lathrop....Engineers	M	4-6x7	....	76-1000	791.6	.....	461-700 (EA)	N	Se	L	CNS	2.68	2.50	2.31	2.12	.375	.375	.500	.500
45	Lathrop....LH	M	6-3¾x4¼	....	62-2200	282.0	.....	173-550 (EA)	N	In	L	CNS	.....	.....	1.50	1.37	.312	.312	.375	.375
46	Lathrop....LH-D6	M	6-4x4¼	....	107-2500	320.0	.....	226-2500 (EA)	N	In	L	CNS	1.75	1.62	1.50	1.37	.356	.356	.375	.375
47	Lathrop....Mystic	M	6-4½x5½	....	96-1600	524.8	.....	321-1350 (EA)	N	Se	L	CNS	2.25	2.25	2.00	2.00	.375	.375	.437	.437
48	Lathrop....Mystic	M	6-4¾x5½	....	106-1600	584.7	.....	379-900 (EA)	N	Se	L	CNS	2.25	2.25	2.00	2.00	.375	.375	.437	.437
49	Lathrop....Standard	M	6-5½x6½	....	73-750	926.5	.....	515-675 (EA)	N	Se	T	CNS	2.25	2.25	2.00	2.00	.375	.375	.437	.437
50	Lathrop....Standard	M	6-5½x6½	....	103-1000	926.5	.....	550-825 (EA)	N	Se	T	CNS	2.25	2.25	2.00	2.00	.500	.500	.437	.437
51	Lathrop....Mystic	M	6-5½x6½	....	155-1500	926.5	.....	561-1200 (EA)	N	Se	L	CNS	2.68	2.68	2.31	2.31	.437	.437	.500	.500
52	Lathrop....Mystic	M	6-5¾x6½	....	179-1600	1012.8	.....	640-1100 (EA)	N	Se	L	CNS	2.68	2.68	2.31	2.31	.437	.437	.500	.500
53	Lever....25A	M,Ind	8-3⅛x6	87-1800	82-1800	368.0	5.90	250-1800	N	In	L	Sil	1.68	1.62	1.50	1.43	.352	.352	.375	.375
54	Mack....EN-11	T	6-3 3/16x4⅜	67-3000	58-3000	210.0	6.0	145-1100	N	In	L	Sil	.....	.....	1.37	1.19	.296	.296	.344	.344
55	Mack....EN-12	T	6-3 5/16x4⅜	72-3000	60-3000	226.0	5.94	166-1000	N	In	L	Sil	.....	.....	1.37	1.19	.296	.296	.344	.344
56	Mack....EN-253	T,B	6-3½x4⅜	83-3000	69-2750	253.0	5.73	180-1000	N	In	L	St	.....	.....	1.62	1.44	.339	.355	.406	.406
57	Mack....EN-271	T,B	6-3⅝x4⅜	90-3000	73-2750	271.0	6.0	193-1200	N	In	L	St	.....	.....	1.62	1.44	.339	.355	.406	.406
58	Mack....EN-290	T,B	6-3¾x4⅜	97-3000	80-2750	290.0	6.1	214-1100	N	In	L	St	.....	.....	1.62	1.44	.339	.355	.406	.406
59	Mack....EN-310	T,B	6-3⅝x5	100-2850	82-2700	309.6	5.6	213-1100	N	In	L	Sta	.....	.....	1.62	1.50	.365	.365	.375	.375
60	Mack....EN-330	T,B,F	6-4x4⅜	100-2800	86-2800	330.0	6.0	244-1000	N	In	L	St	.....	.....	1.62	1.44	.339	.355	.406	.406
61	Mack....EN-354	T,B	6-3⅞x5	115-2850	100-2700	353.8	5.5	254-1100	N	In	L	Sta	.....	.....	1.62	1.50	.365	.365	.375	.375
62	Mack....EN-431	T	6-4⅛x5⅜	127-2650	106-2500	431.0	5.72	327-1200	N	In	I	Sta	.....	.....	1.94	1.56	.418	.418	.437	.437
63	Mack....EN-471	T	6-4 5/16x5⅜	135-2550	115-2400	471.0	5.63	351-1200	N	In	I	Sta	.....	.....	1.91	1.56	.418	.418	.437	.437
64	Mack....EN-510	T,B,F	6-4 7/16x5½	147-2550	129-2400	510.0	5.63	382-1200	N	In	I	Sta	.....	.....	1.81	1.56	.418	.418	.437	.437
65	Mack....EN-611	T,B,F	6-4¾x5¾	163-2250	145-2100	611.0	5.4	462-1200	N	In	I	Sta	.....	.....	2.05	1.75	.500	.500	.437	.437
66	Mack....EN-707	T,B,F	6-5x6	178-2150	160-2000	707.0	5.35	530-600	N	In	I	Sta	.....	.....	2.05	1.75	.500	.500	.437	.437
67	M-M Twin City (8)....EE	Tr, Ind	4-3⅝x4	26-1400	24-1400	165.1	5.75	107-1000 (BE)	N	Se	HH	XBe	1.46	1.46	1.25	1.29	.354	.354	.343	.343
68	M-M Twin City....RE	Tr, Ind	4-3⅝x4½	34-1500	32-1500	185.7	5.75	124-1100 (BE)	N	Se	HH	XBe	1.46	1.46	1.25	1.25	.354	.354	.343	.343
69	M-M Twin City....KEF	Tr, Ind	4-4¼x5	49-1275	47-1275	283.7	5.40	195-1150 (BE)	N	Se	I	XBe	1.71	1.59	1.50	1.37	.488	.488	.437	.437
70	M-M Twin City....LE	Tr, Ind	4-4⅝x6	64.5-1075	61-1075	403.2	5.25	304-975 (BE)	N	Se	I	XBe	1.84	1.71	1.62	1.50	.488	.488	.437	.437
71	M-M Twin City....ME	Ind	4-8x9	152-650	....	1810.0	4.70	1250-300 (BE)	N	Se	I	XBe	3.34	3.34	3.00	3.00	.687	.683	.687	.687
72	M-M Twin City....CE	Ind	6-4¼x5	72-1275	....	425.5	5.60	295-1100 (BE)	N	Se	I	XBe	1.71	1.59	1.50	1.37	.488	.488	.437	.437
73	M-M Twin City....HE	Ind	6-4⅝x6	92-1075	....	605.0	5.25	445-1000 (BE)	N	Se	I	XBe	1.84	1.71	1.62	1.50	.488	.488	.437	.433
74	M-M Twin City....NE	Ind	6-8x9	220-650	....	2714.0	4.70	1780-450 (BE)	N	Se	I	XBe	3.34	3.34	3.00	3.00	.687	.683	.687	.683
75	M-M Twin City....							Deleted												
76	M-M Twin City....OEA	Tr	4-3⅝x5	40-1500	....	206.5	6.15	145-1300	N	Se	HH	XBe	1.46	1.46	1.25	1.25	.354	.354	.343	.343
77	Oliver....60HC	Tr	4-3⅛x3½	....	21.2-1500	120.6	6.00	75-1000 (EA)	W	In	I	Sil	1.18	1.12	1.06	1.00	.281	.281	.375	.375
78	Oliver....80HC	Tr	4-4¼x5¼	....	46.1-1200	298.0	5.25	190-850 (EA)	W	In	I	Sil	2.00	1.75	1.75	1.50	.406	.406	.375	.375
79	Oliver....80KD	Tr	4-4½x5¼	....	45-1200	334.0	4.23	190-850 (EA)	W	In	I	Sil	2.00	1.75	1.75	1.50	.406	.406	.375	.375
80	Oliver....90	Tr	4-4¾x6¼	....	56.7-1125	443.0	4.10	250-850 (EA)	W	In	I	Sil	2.31	2.31	2.00	2.00	.437	.437	.437	.437
81	Oliver....99	Tr	4-4¾x6¼	....	65-1125	443.0	5.04	295-850 (EA)	W	In	I	Sil	2.31	2.00	2.00	1.75	.437	.437	.437	.437
82	Oliver....70KD	Tr	6-3⅛x4⅜	....	31.3-1500	201.3	4.50	105-1150 (EA)	W	In	I	Sil	1.54	1.20	1.37	1.06	.390	.390	.375	.375
83	Oliver....70HC	Tr	6-3⅛x4⅜	....	36.3-1500	201.3	6.50	105-1150 (EA)	W	In	I	Sil	1.54	1.20	1.37	1.06	.390	.390	.375	.375
84	Reo....GC-228	T	6-3⅜x4¼	83-3200	....	228.0	6.20	177-1000 (BE)	N	In	L	Sil	1.78	1.62	.....	.....	.312	.312	.373	.373
85	Reo....GC-245	T	6-3½x4¼	89-3100	....	245.0	6.20	191-1000 (BE)	N	In	L	Sil	1.78	1.62	.....	.....	.312	.312	.373	.373
86	Reo....GC-288	T	6-3½x5	94-3000	....	288.0	6.20	221-1200 (BE)	N	In	L	Sil	1.78	1.62	.....	.....	.312	.312	.373	.373
87	Reo....GC-310	T, B	6-3⅝x5	101-3000	....	310.0	6.20	241- 900 (BE)	N	In	L	Sil	1.78	1.62	.....	.....	.312	.312	.373	.373
88	Scripps....34	M	4-3¼x4	....	32-2200	134.0	5.20	92-2000 (BE)	....	In	L	Sil	1.48	1.35	1.25	1.12	.250	.250	.310	.310
89	Scripps....36	M	4-3¼x4	....	50-3200	134.0	.....	....	....	In	L	Sil	1.48	1.35	1.25	1.12	.250	.250	.310	.310
90	Scripps....F4	M	4-3¾x5	....	81-3000	220.0	6.10	....	....	In	L	Sil	1.93	1.93	.....	.....	.406	.406	.375	.375
91	Scripps....96A-97A	M	6-3 7/16x4⅛	....	95-3000	221.0	5.85	187-1200 (BE)	....	In	L	Sil	1.60	1.39	1.43	1.12	.281	.281	.312	.312
92	Scripps....F6	M	6-3¾x5	....	120-3000	331.0	6.10	....	....	In	L	Sil	1.93	1.93	.....	.....	.406	.406	.375	.375
93	Scripps....104A-105A	M	6-4x4¼	....	110-3000	320.0	5.63	239-1700 (BE)	....	In	L	Sil	1.75	1.62	1.50	1.37	.322	.322	.373	.373
94	Scripps....152-153	M	6-4¼x5¼	....	169-3000	447.0	6.20	....	....	Se	L	Sil	2.25	2.25	.....	.....	.375	.375	.437	.437
95	Scripps....154, 5, 6, 7	M	6-4¼x5¼	....	155-3000	447.0	6.20	....	....	Se	L	Sil	2.25	2.25	.....	.....	.375	.375	.437	.437
96	Scripps....162-163	M	6-4½x5¾	....	166-2400	549.0	5.75	....	....	Se	L	Sil	2.37	2.28	.....	.....	.405	.375	.437	.437

(For abbreviations see pages 120-121)

Engines—*Continued*

Valves: Seats: Angle (Deg.)	Valves: Seats: Inserts Used?	Valves: Seats: Insert Material (S.A.E. No.)	Camshaft Drive—Type	Pistons: Material	Pistons: Weight with Pins, Rings, Bushings (Oz.)	Pistons: Piston Pin—Diameter and Length (In.)	Number of Rings per Piston	Connecting Rods: Material	Connecting Rods: Center to Center Length (In.)	Connecting Rods: Weight with Bushing and Cap (Oz.)	Crankshaft: Material	Crankshaft: Counter Balance Used	Crankshaft: Crank-Pin Diameter and Length (In.)	Crankshaft: Main Bearings: Number	Main Bearings: Diameter and Length (In.): Front	Main Bearings: Diameter and Length (In.): Rear	Oil Pressure to—	Spark Plug—Thread Size	Carburetor: Make	Carburetor: Size	Engine Weight without Carburetor or Ignition (Lb.)	Overall Dimensions (In.): Width	Overall Dimensions (In.): Height	Overall Dimensions (In.): Length	Line Number
45	N	......	HG	Al	60	1.25x3.93	5	3140	9⅜	81	CS‡	Op	2.62x2.00	7	3.00x1.93	3.00x2.93	abe	⅞-18	Op	1¾	1000	21 11/32	31 11/16	45 9/16	1
45	N	......	HG	Al	62	1.25x4.06	5	3140	9⅜	81	CS‡	Op	2.62x2.00	7	3.00x1.93	3.00x2.93	abe	⅞-18	Op	1¾	1010	21 11/32	31 11/16	45 9/16	2
45	N	......	HG	Al	65	1.25x4.10	5	CNM	9⅜	99	CS‡	Op	3.00x2.00	7	3.50x1.93	3.50x2.93	abe	⅞-18	Op	1¾	1195	22 5/16	30	44¾	3
(h)	N	......	HG	Al	69	1.25x4.10	5	CNM	9⅜	99	CS‡	Op	3.00x2.00	7	3.50x1.93	3.50x2.93	abe	⅞-18	Op	1¾	1195	22 5/16	30	44¾	4
30	E	......	HG	Al	95	1.50x4.43	4	3140	12	143	CS‡	Op	3.00x2.25	7	3.50x2.37	3.50x3.50	abce	⅞-18	Op	2	1810	24½	40½	54½	5
30	E	......	HG	Al	105	1.50x4.56	4	3140	12	143	CS‡	Op	3.00x2.25	7	3.50x2.37	3.50x3.50	abce	⅞-18	Op	2	1810	24½	40½	54½	6
30	E	......	HG	Al	117	1.50x4.81	4	3140	12	143	CS‡	Op	3.00x2.25	7	3.50x2.37	3.50x3.50	abce	⅞-18	Op	2	1830	24½	40½	54½	7
30	E	......	HG	Al	127	1.50x5.06	4	3140	12	143	1045	Op	3.00x2.25	7	3.50x2.37	3.50x3.50	abce	⅞-18	Op	2	1830	24½	40½	54½	8
45	N	......	HG	CA	13	.750x2.44	4	1045	8⅝	31	1045	Y	1.94x1.37	3	2.34x1.62	2.41x2.37	Splash	14 mm	Car	1¼	482	25	37¼	29½	9
45	N	......	SB	Cl	35	.919x2.50	4	1040	7¼	33	1045	N	1.75x1.19	3	2.12x1.37	2.12x1.84	abceg	18 mm	Zen	⅞	457*	16 5/16	33½	30 11/16	10
45	N	......	SB	Cl	53	1.11x2.78	4	1040	8	57	1045	N	2.25x1.23	3	2.50x1.49	2.50x1.49	abceg	18 mm	Own	1	639*	17½	32 11/16	33⅛	11
45	E	MA	SB	Cl	82	1.31x3.25	4	1040	10	....	1045	N	2.50x1.72	3	2.75x1.56	2.75x1.56	abceg	18 mm	Own	1¼	914*	19½	38¾	37	12
45	E	MA	SG	Cl	111	1.50x3.71	4	1040	11	123	1045‡	Y	2.99x1.97	3	3.25x1.82	3.25x1.82	abcdeg	⅞-18	Own	1⅜	1253*	23 13/16	42 5/16	40¼	13
45	......	......	HG	Al	34	1.10x3.17	4	AS	9¼	49	CS‡	N	2.25x1.62	7	2.70x1.53	2.70x2.54	abcde	⅞-18	Zen	1⅜	1950*	28	35⅜	49 5/16	14
45	......	......	HG	Cl	130	1.50x4.10	4	AS	11¾	137	CNS	N	2.75x2.25	7	3.25x2.56	3.25x3.50	abcde	⅞-18	Zen	1½	3120*	35	50 3/16	59⅛	15
30	N	......	HG	Cl	19	.687x2.18	3	CS	5⅛	15	CS	N	1.50x1.00	3	2.00x1.37	2.00x1.31	abcr	14 mm	Str	¾	300*	18 11/16	17⅝	29 5/16	16
30	N	......	HG	Al	20	.750x2.87	4	3140	6 5/16	20	CS	N	1.75x1.12	3	2.00x1.62	2.00x1.58	abcr	⅞-18	Str	1¼	405*	23⅛	21 11/16	34 3/16	17
45	N	......	Ch	Al	12	.812x2.78	3	MS	9 3/16	34	1040	Y	1.93x1.31	3	2.33x1.75	2.33x1.92	abcr	14 mm	Str	1¼	495	21¼	24½	36	18
45	N	......	Ch	Al	12	.812x2.78	3	MS	9 3/16	34	1040	Y	1.93x1.31	3	2.33x1.75	2.33x1.92	abcr	14 mm	Str	1¼	495	21¼	24½	36	19
45	N	......	Ch	Al	12	.812x2.78	3	MS	9 3/16	34	1040	Y	1.93x1.31	3	2.33x1.75	2.33x1.92	abcr	14 mm	Str	1¼	495	21¼	24½	36	20
(h)	N	......	Ch	CNI	32	.937x2.87	3	DFS	7 1/16	32	DFS	Y	2.00x1.06	5	2.50x1.87	2.37x1.25	abcder	14 mm	Str	1½	860*	24	23 3/16	52½	21
30	N	......	HG	Al	24	.875x2.79	4	CS	7	26	CS	N	2.00x1.25	7	2.50x1.93	2.50x1.87	abcr	⅞-18	Str	1½	620*	24	24⅛	42 5/16	22
(h)	N	......	Ch	Cl	......	......	3	DFS	7 1/16	37	DFS	Y	2.12x1.28	4	2.62x1.56	2.50x1.25	abcder	14 mm	Str	1½	790*	24	23 3/16	47⅞	23
30	N	......	HG	Al	40	1.00x3.51	4	CS	8	38	CS	N	2.00x1.50	7	2.50x2.12	2.50x1.37	abcr	⅞-18	Str	1¾	925*	21 13/16	27¾	52⅞	24
30	N	......	HG	Al	......	1.12x3.68	4	CS	9½	51	CS	N	2.25x1.50	7	2.62x1.75	2.62x2.75	abcr	14 mm	Str	1¾	1125*	24¼	29⅝	56⅞	25
30	N	......	HG	Al	......	1.12x3.62	4	CS	9	51	CS	N	2.25x1.12	7	2.68x2.75	2.68x1.75	abcr	14 mm	Str	2	1125*	24¼	29⅝	56⅞	26
(h)	E	HS	HG	Als	62	1.25x3.62	4	DFS	11	80	CS	N	2.25x2.23	7	2.50x3.91	2.50x2.56	abcder	14 mm	Str	2	1390*	26¾	33¼	69⅞	27
45	N	......	HG	Als	82	1.25x4.50	4	DFS	11	80	CS	N	2.25x2.23	7	2.50x3.91	2.50x2.62	abcder	18 mm	Str	2	1570*	29 1/16	34⅛	69⅞	28
45	N	......	HG	Als	82	1.25x4.50	4	DFS	11	80	CS	N	2.25x2.23	7	2.50x3.91	2.50x2.62	abcder	14 mm	Str(2)	1¾	1570*	26⅛	34⅛	69⅞	29
45	N	......	SB	Als	82	1.25x4.50	4	DFS	11	80	DFS	N	2.25x2.23	7	2.50x3.91	2.50x2.62	abcder	18 mm	Str(2)	1¾	1500*	30½	39¾	69¾	30
45	Bo	TA	HG	CAS	12	.750x2.85	3	AS	7	16	CAS	Y	2.00x1.94	3	2.00x1.81	2.00x2.25	abcr	⅞-18	Ford	....	730	29 1/16	31 1/16	43 11/16	31
45	Bo	TA	HG	CAS	17	.750x2.84	3	AS	7	17	CAS	Y	2.14x1.75	3	2.50x1.72	2.50x2.25	abce	14 mm	Ford	....	730	29 1/16	31 1/16	43 11/16	32
(h)	......	......	Ch	Cl	32	.937x2.87	3	DFS	7 1/16	32	DFS	Y	2.00x1.56	5	2.37x2.25	2.24x1.31	abcder	14 mm	Str	1½	860*	24	23 3/16	52½	33
45	Bo	TA	HG	CAS	11	.750x2.48	3	DFS	......	22	CAS	Y	2.12x1.57	4	2.40x1.83	2.40x2.54	abce	14 mm	Ford	....	800	24 11/16	32	51¼	34
45	N	......	SB	Als	82	1.25x4.50	4	CNS	11	184	CNS	Y	2.75x2.25	7	3.00x3.84	3.00x2.25	abcder	18 mm	Str(4)	2	2700*	42½	43 3/16	75 11/16	35
45	......	......	HG	Cl	160	1.37x4.62	4	AS	12¼	96	CNS	N	1.87x2.75	3	2.25x5.00	2.25x4.00	abe	⅞-18	Zen	1¼	975	23½	22	55½	36
45	......	......	HG	Cl	179	1.37x5.00	4	AS	12¼	96	CNS	N	1.87x2.75	3	2.25x5.00	2.25x4.00	abe	⅞-18	Zen	1¼	1000	23½	22	55½	37
45	......	......	HG	Cl	160	1.37x4.62	4	AS	12¼	96	CNS	N	1.87x2.75	4	2.25x5.00	2.25x4.00	abe	⅞-18	Zen	1½	1400	25	22¼	60½	38
45	......	......	HG	Cl	179	1.37x5.00	4	AS	12¼	96	CNS	N	1.87x2.75	4	2.25x5.00	2.25x4.00	abe	⅞-18	Zen	1½	1450	25	22¼	60½	39
30	......	......	HG	Al	......	.750x2.81	3	AS	6 5/16	......	CNS		1.87x2.75	4			abe	⅞-18	Zen	1	440	17½	14⅝	40½	40
45	......	......	HG	Cl	160	1.37x4.62	4	AS	12¼	96	CNS	N	2.00x1.50	7	2.00x2.18	2.00x2.62	abe	⅞-18	Zen	1½	1700	25¾	22¼	68½	41
45	......	......	HG	Cl	179	1.37x5.00	4	AS	12¼	96	CNS	N	1.87x2.75	5	2.25x5.00	2.25x4.00	abe	⅞-18	Zen	1½	1750	25¾	22¼	68½	42
45	E	Spec	HG	Cl	186	1.50x5.00	4	AS	13¼	172	CNS	N	1.87x2.75	5	2.25x5.00	2.25x4.00	......	⅞-18	Zen	....	2100	29¼	24	74¼	43
45	E	Spec	HG	Cl	204	1.50x5.50	4	AS	13¼	172	CNS	N	2.75x2.75	5	3.00x3.50	3.00x3.50	abce	⅞-18	Zen	....	2290	29¼	24	75	44
30	......	......	HG	Al	......	1.00x3.50	3	AS	8	......	CNS	N	2.75x2.75	5	3.00x3.50	3.00x3.50	abce	⅞-18	Zen	1¼	830	21⅛	17	51	45
30	E	Spec	HG	Al	40	1.00x3.50	4	DFS	8	36	Spec	N	2.00x1.50	7	2.50x1.31	2.50x2.12	abe	⅞-18	Zen	1½	820	21⅛	25	51	46
45	......	......	HG	Cl	96	1.37x3.87	4	Dur	12¼	68	CNS	N	2.00x1.50	7	2.50x1.31	2.50x1.12	abe	⅞-18	Hol	....	1700	24½	27¾	68	47
45	......	......	HG	Cl	104	1.37x4.12	4	Dur	12¼	68	CNS	N	2.25x2.37	7	2.75x3.25	2.75x2.12	abce	⅞-18	Hol	....	1700	24½	27¾	68	48
45	......	......	HG	Cl	179	1.37x5.00	4	AS	12¼	96	CNS	N	2.25x2.37	7	2.75x3.25	2.75x2.12	abce	⅞-18	Zen(2)	1½	2500	26½	22¾	90½	49
45	......	......	HG	Cl	179	1.37x5.00	4	AS	12¼	96	CNS	N	2.12x2.75	7	2.62x5.00	2.62x4.00	abe	⅞-18	Zen(2)	1½	2500	26½	23¾	88½	50
45	......	......	HG	Cl	176	1.50x5.00	4	AS	13¼	164	CNS	N	2.12x2.75	7	2.62x5.00	2.62x4.00	abe	⅞-18	Hol	....	2435	24½	29⅝	78½	51
45	......	......	HG	Cl	176	1.25x5.12	4	AS	13¼	164	CNS	N	2.75x2.75	7	3.00x3.37	3.00x3.25	abce	⅞-18	Hol	....	2430	24½	29⅛	78½	52
45	E	CA	Ch	Al	18	.812x1.56	4	......	......	......	1045	N	2.75x1.37	5	3.00x1.50	3.00x2.37	abce	14 mm	Zen	1½	1150	23½	35	49¾	53
(h)	E	HS	HG	Cl	31	.859x2.68	5	1030	7	32	1045	Y	1.94x1.31	4	2.25x....	2.25x....	abct	18 mm	Zen	1¼	501	26	26	39 3/16	54
(h)	E	HS	HG	Al	26	.859x2.68	5	1030	7	32	1045	Y	2.06x1.31	4	2.37x....	2.37x....	abct	18 mm	Zen	1¼	510	26	26	39 3/16	55
(k)	E	Nif	HG	Al	36	1.11x2.90	5	1030	8⅜	49	1045	Y	2.25x1.37	7	2.62x....	2.62x....	abct	18 mm	Zen	1½	749	18¼	29 3/16	40	56
(k)	E	Nif	HG	Al	39	1.11x3.06	5	1030	8⅜	49	1045	Y	2.25x1.37	7	2.62x....	2.62x....	abct	18 mm	Zen	1½	738	18¼	29 3/16	40	57
(k)	E	Nif	HG	Al	43	1.11x3.18	5	1030	8⅜	49	1045	Y	2.25x1.37	7	2.62x....	2.62x....	abct	18 mm	Zen	1½	759	18¼	29 3/16	40	58
30	E	Nif	HG	Al	38	1.00x3.25	5	4130	11¼	53	1025	Y	2.37x1.62	7	3.00x....	3.00x....	abcef	18 mm	Zen	1½	885	26⅞	34⅞	46 17/32	59
(h)	E	Nif	HG	Al	47	1.11x3.45	5	1030	8⅜	49	1045	Y	2.25x1.37	7	2.62x....	2.62x....	abct	18 mm	Zen	1½	771	18¼	29 3/16	40	60
30	E	Nif	HG	Al	43	1.00x3.50	5	4130	11¼	53	1025	Y	2.37x1.62	7	3.00x....	3.00x....	abcef	18 mm	Zen	1¾	907	26⅞	34⅞	46 17/32	61
30	E	Nif	HG	Al	......	1.31x3.69	5	4130	10½	75	1025	Y	2.75x1.72	7	3.50x....	3.50x....	abcfg	14 mm	Zen	1¾	1490	27⅞	46	50 15/16	62
30	E	Nif	HG	Al	......	1.31x3.87	5	4130	10½	75	1025	Y	2.75x1.72	7	3.50x....	3.50x....	abcfg	14 mm	Zen	1¾	1500	27⅞	46	50 15/16	63
30	E	Nif	HG	Al	......	1.31x4.00	5	4130	10½	75	1025	Y	2.75x1.72	7	3.50x....	3.50x....	abcfg	14 mm	Zen	1¾	1520	27⅞	46	50 15/16	64
30	E	Nif	HG	Al	83	1.44x4.16	5	4130	11¼	100	1025	Y	3.00x2.09	7	3.50x....	3.50x....	abcfg	14 mm	Zen	2	1700	30½	47¼	53 3/32	65
30	E	Nif	HG	Al	95	1.44x4.41	5	4130	11¼	100	1025	Y	3.00x2.09	7	3.50x....	3.50x....	abcfg	14 mm	Zen	2	1710	30½	47¼	53 3/32	66
45	E	CNM	HG	Cl	55	1.00x3.00	4	1040	9	51	1045	N	2.62x1.28	2	SAE2I2(9)	3.00x2.18	abet	14 mm	Sch	1	640	18½	36½	34	67
45	E	CNM	HG	Cl	54	1.00x3.00	4	1040	9	51	1045	N	2.62x1.28	2	BCA3I3(9)	BCA3I4(9)	bet	14 mm	Sch	1	650	18½	36½	34	68
45	E	CNM	HG	Cl	80	1.25x3.87	4	1040	10	97	1045	N	2.57x2.21	3	2.90x2.18	2.90x3.50	abcegt	⅞-18	Sch	1	1140	29¼	41½	41½	69
45	E	CNM	HG	Cl	104	1.25x4.25	4	1040	11½	97	1045	N	2.75x2.09	3	2.90x2.'8	2.90x3.17	abceg	⅞-18	Sch	1¼	1275	24½	60	45½	70
45	Bo	CNM	HG	Cl	598	2.18x7.18	4	1045	20½	656	1045	N	3.50x4.37	5	3.50x5.21	3.50x6.37	abcdegt	⅞-18	Zen	2	4700	38½	68¼	72	71
45	E	CNM	HG	Cl	80	1.25x3.87	4	1040	10	97	1045	Y	2.57x2.21	4	2.90x2.18	2.90x3.50	abcegt	⅞-18	Zen	1½	1850	28¾	45 5/16	59¼	72
45	E	CNM	HG	Cl	104	1.25x4.25	4	1045	11½	97	1045	Y	2.75x2.09	4	2.90x2.18	2.90x3.50	abcegt	⅞-18	Zen	1½	1950	28¾	43 5/16	59¼	73
45	Bo	CNM	HG	Cl	598	2.18x7.18	4	1045	20½	608	1045	N	3.81x4.25	7	4.00x5.21	4.00x6.37	abcdegt	⅞-18	Zen(2)	1¾	6650	37½	74	97	74
													Deleted												75
45	E	CA	HG	Ayl	13	1.00x3.00	4	1040	8¾	12	Pro	N	2.62x1.28	3	......	3.00x2.18	abe	14 mm	Sch	1	700	18½	38½	34	76
45	E	CA	HG	Cl	45	.875x2.70	4	1045	6	29	1045	N	2.00x1.37	3	2.25x1.43	2.25x1.43	a	18 mm	Sch	1	345	17	24½	28½	77
45	E	CA	HG	Cl	83	1.31x3.81	4	1045	10½	68	1045	N	2.37x2.12	3	2.37x2.12	2.37x2.75	abcde	⅞-18	Sch	1¼	850	21¼	34¾	37¾	78
45	E	CA	HG	Cl	94	1.31x4.06	4	1045	10½	68	1045	N	2.37x2.12	3	2.37x2.12	2.37x2.75	abcde	⅞-18	Sch	1¼	850	21¼	24¾	37¾	79
45	E	CA	HG	Cl	109	1.50x4.37	4	1040	12½	145	1045	N	2.75x2.50	3	3.00x2.81	3.00x3.75	abcde	⅞-18	Sch	1¼	1200	24¼	44	44¼	80
45	E	CA	HG	Cl	109	1.50x4.37	4	1040	12½	145	1045	N	2.75x2.50	3	3.00x2.81	3.00x3.75	abcde	⅞-18	Sch	1¼	1200	24¼	44	44¼	81
(h)	E	CA	HG	Cl	39	.859x2.62	4	1030	7	28	1045	N	1.93x1.12	4	2.25x1.23	2.25x1.62	ab	18 mm	Zen	1¼	......	17½	29	31½	82
(h)	E	CA	HG	Cl	39	.859x2.62	4	1030	7	28	1045	N	1.93x1.12	4	2.25x1.23	2.25x1.62	ab	18 mm	Zen	1	530	17½	29	31½	83
45	E	......	Ch	Al	23	.983x2.90	4	1035	10½	50	1045	Y	2.19x1.50		2.62x1.94	2.62x2.47	abcde	14 mm	Zen	1¼	758*	19¼	30¼	38¾	84
45	E	......	Ch	Al	26	.983x3.03	4	1035	10½	50	1045	Y	2.19x1.50	7	2.62x1.94	2.62x2.47	abcde	14 mm	Zen	1¼	763*	19¼	30¼	38¾	85
45	E	......	Ch	Al	26	.983x3.03	4	1035	10½	50	1045	Y	2.19x1.50	7	2.62x1.94	2.62x2.47	abcde	14 mm	Zen	1½	780*	19¼	30⅝	38¾	86
45	E	......	Ch	Al	29	.983x3.13	4	1035	10½	50	1045	Y	2.19x1.50	7	2.62x1.94	2.62x2.47	abcde	14 mm	Zen	1½	785*	19¼	30⅝	38¾	87
30	......	......	HG	Cl	29	.750x2.81	3	3140	6 5/16	21	1045	N	1.75x1.12	3	2.00x1.56	2.00x1.62	abr	⅞-18	Zen	1¼	410*	15½	21¾	32¾	88
30	......	......	HG	Al	......	.750x2.81	3	AS	6 5/16	21	1045	N	1.75x1.12	3	2.00x1.56	2.00x1.62	abr	⅞-18	Zen	1¼	410*	15½	21¾	32¾	89
45	......	......	HG	Al	33	1.12x3.25	4	Dur	10½	41	NS	N	2.18x1.87	3	2.25x2.62	2.25x2.62	abc	18 mm	Str	1¼	660*	23	28 5/16	45¼	90
30	......	......	HG	Al	......	.875x2.90	4	CS	7	26	CS♦	N	2.00x1.25		2.50x1.31	2.50x1.93	abr	14 mm	Zen	1½	675*	21	23¼	41½	91
45	......	......	HG	Al	33	1.12x3.25	4	Dur	10½	41	NS	Y	2.18x1.87	4	2.25x2.62	2.25x2.62	abc	18 mm	Zen	1½	900*	19¾	28 13/16	58½	92
45	......	......	HG	Al	40	1.00x3.51	4	1035	8	37	1045	N	2.00x1.50	7	2.50x1.31	2.50x2.12	abr	⅞-18	Zen	1¾	860*	21	26½	49¾	93
45	E	Tun	HG	Al	49	1.25x3.68	4	AS	10⅞	70	NS	Y	2.75x2.25	4	3.25x2.25	3.25x2.25	abc	18 mm	Hol	2	1050*	27¾	32 5/16	56¾	94
45	E	Tun	HG	Al	49	1.25x3.68	4	AS	10⅞	70	NS	Y	2.75x2.25	4	3.25x2.25	3.25x2.25	abc	18 mm	Str	2	1150*	24¾	29⅞	56¾	95
45	......	......	HG	Al	50	1.37x3.84	4	AS	11¼	84	NS	Y	2.87x2.00	4	3.00x3.00	3.00x3.62	ab	18 mm	Hol	1½	1325*	26¼	36 5/16	68	96

(For abbreviations see pages 120-121)

American Gasoline

Line Number	Engine Make and Model	Designed for	Number of Cylinders, Bore and Stroke (In.)	MAXI UM BRA E Hp. at Specified R.P.M. — With Bare Engine	MAXI UM BRA E Hp. at Specified R.P.M. — With Standard Accessories	Piston Displacement (Cu. In.)	Compression Ratio	Maximum Torque at R.P.M. (Lb. Ft.), with or without Accessories	Cylinder Liners—Type	Crankcase—Upper Half Integral with Cylinders	VALVES — Arrangement	VALVES — Exhaust Head Material (S.A.E. No.)	VALVES — Max. Head Diameter (In.) — Intake	VALVES — Max. Head Diameter (In.) — Exhaust	VALVES — Min. Port Diameter (In.) — Intake	VALVES — Min. Port Diameter (In.) — Exhaust	VALVES — Lift (In.) — Intake	VALVES — Lift (In.) — Exhaust	VALVES — Stem Diameter (In.) — Intake	VALVES — Stem Diameter (In.) — Exhaust
1	Scripps....166-167	M	6-4½x5¾	....	145-2200	549.0	5.20	....	...	Se	L	Sil	2.56	2.28	.....	.....	.405	.375	.437	.437
2	Scripps....168-169	M	6-4½x5¾	....	175-2400	549.0	5.75	....	...	Se	L	Sil	2.37	2.28	.....	.....	.405	.375	.437	.437
3	Scripps....172A-173A	M	6-4¾x5¾	....	200-2400	611.0	5.20	....	...	Se	L	Sil	2.37	2.28	.....	.....	.405	.375	.437	.437
4	Scripps....176A-177A	M	6-4¾x5¾	....	155-2200	611.0	5.20	....	...	Se	L	Sil	2.56	2.28	.....	.....	.405	.375	.437	.437
5	Scripps....178-179	M	6-4¾x5¾	....	200-2400	611.0	5.75	....	...	Se	L	Sil	2.37	2.28	.....	.....	.405	.375	.437	.437
6	Scripps....202-203	M	6-5x5¾	....	212-2400	678.0	6.20	....	...	Se	L	Sil	2.56	2.28	.....	.....	.405	.375	.437	.437
7	Scripps....206-207	M	6-5x5¾	....	170-2200	678.0	5.75	....	...	Se	L	Sil	2.56	2.28	.....	.....	.405	.375	.437	.437
8	Scripps....208-209	M	6-5x5¾	....	225-2400	678.0	5.85	....	...	Se	L	Sil	2.50	2.37	.....	.....	.406	.375	.437	.437
9	Scripps....214-215	M	6-5x5¾	....	185-2000	678.0	5.75	....	...	Se	L	Sil	2.50	2.37	.....	.....	.406	.375	.437	.437
10	Scripps....V43-90, V47-90	M	8-3 1/16x3¾	....	90-3600	221.0	6.16	154-2200 (BE)	...	In	L	Sil	1.53	1.53	.....	.....	.296	.296	.312	.312
11	Scripps...V43M-100, V47M-100	M	8-3.185x3¾	....	100-3600	239.0	6.15	178-2200 (BE)	...	In	L	CNS	1.53	1.53	.....	.....	.292	.292	.311	.311
12	Scripps....V63-130, V67-130	M	12-2 15/16x3¾	....	130-3600	305.0	6.70	232-2200 (BE)	...	In	L	CNS	1.53	1.53	.....	.....	.292	.292	.311	.311
13	Scripps....302-303	M	12-4¼x5¼	....	304-2400	894.0	6.20	....	...	Se	L	Sil	2.25	2.25	.....	.....	.375	.375	.437	.437
14	Scripps....304-305	M	12-4¼x5¼	....	250-2400	894.0	6.20	....	...	Se	L	Sil	2.25	2.25	.....	.....	.375	.375	.437	.437
15	Scripps....306-307	M	12-4¼x5¼	....	280-2400	894.0	6.20	....	...	Se	L	Sil	2.25	2.25	.....	.....	.375	.375	.437	.437
16	Sterling....Petrel L-6	M,T,Tr,B,Ind	6-5¼x6	....	115-1200	780.0	4.30	500-1400 (EA)	N	Se	L	Sil	2.25	2.25	.....	.....	.455	.455	.437	.437
17	Sterling....Petrel L-6	M,T,Tr,B,Ind	6-5¼x6	....	145-1500	780.0	4.68	500-1400 (EA)	N	Se	L	Sil	2.25	2.25	.....	.....	.455	.455	.437	.437
18	Sterling....Petrel L-6	M,T,Tr,B,Ind	6-5¼x6	....	145-1500	780.0	4.68	500-1400 (EA)	N	Se	L	Sil	2.25	2.25	.....	.....	.455	.455	.437	.437
19	Sterling....Petrel L-6-6	M,T,Tr,B,Ind	6-5¼x6	....	180-1800	780.0	5.00	500-1400 (EA)	N	Se	L	Sil	2.25	2.25	.....	.....	.455	.455	.437	.437
20	Sterling....Petrel Reduction-L	M,T,Tr,B,Ind	6-5¼x6	....	175-1800	780.0	4.68	500-1400 (EA)	N	Se	L	Sil	2.25	2.25	.....	.....	.455	.455	.437	.437
21	Sterling....Petrel L-6	M,T,Tr,B,Ind	6-5¼x6	....	200-2000	780.0	5.54	500-1400 (EA)	N	Se	L	Sil	2.25	2.25	.....	.....	.455	.455	.437	.437
22	Sterling....Petrel L-6	M,T,Tr,B,Ind	6-5¼x6	....	225-2200	780.0	5.50	500-1400 (EA)	N	Se	L	Sil	2.25	2.25	.....	.....	.455	.455	.437	.437
23	Sterling..Dolphin-Med. GRM-6	Tr, M, Ind	6-5¾x6¾	....	165-1200	1051.6	3.85	785-1200 (EA)	N	Se	I	Sil	1.87	1.87	.....	.....	.375	.375	.437	.437
24	Sterling....Dolphin 6-GR-6	Tr, M, Ind	6-5¾x6¾	....	225-1550	1051.6	4.08	785-1200 (EA)	N	Se	I	Sil	1.87	1.87	.....	.....	.375	.375	.437	.437
25	Sterling....Dolphin 6-GRS-6	Tr, M, Ind	6-5¾x6¾	....	300-2000	1051.6	4.70	785-1200 (EA)	N	Se	I	Sil	1.87	1.87	.....	.....	.375	.375	.437	.437
26	Sterling....Viking 11 T-6	Tr, M, Ind	6-8x9	....	190-600	2714.3	3.93	1900-1000 (EA)	W	Se	I	Sil	2.59	2.59	.....	.....	.556	.556	.562	.562
27	Sterling....Viking 11 T-6	Tr, M, Ind	6-8x9	....	300-900	2714.3	4.18	1900-1000 (EA)	W	Se	I	Sil	2.59	2.59	.....	.....	.556	.556	.562	.562
28	Sterling....Viking 11 T-6	Tr, M, Ind	6-8x9	....	425-1200	2714.3	4.18	1900-1000 (EA)	W	Se	I	Sil	2.59	2.59	.....	.....	.556	.556	.562	.562
29	Sterling....Viking 11 8-T-8	Tr, M, Ind	8-8x9	....	250-600	3619.0	3.93	2520-1050 (EA)	W	Se	I	Sil	2.59	2.59	.....	.....	.556	.556	.557	.557
30	Sterling....Viking 11 8-T-8	Tr, M, Ind	8-8x9	....	400-900	3619.0	4.18	2520-1050 (EA)	W	Se	I	Sil	2.59	2.59	.....	.....	.556	.556	.557	.557
31	Sterling....Viking 11 8-T-8	Tr, M, Ind	8-8x9	....	565-1200	3619.0	4.18	2520-1050 (EA)	W	Se	I	Sil	2.59	2.59	.....	.....	.556	.556	.557	.557
32	Sterling....Viking 11TC68	M	8-8x9	....	600-1200	3619.0	5.00	2626-1200 (EA)	W	Se	I	Sil	2.59	2.59	.....	.....	.556	.556	.557	.557
33	Sterling....Admiral ‡V-2500-6	M	12-6⅜x6½	....	1200-2350	2500.0	6.00	.... (EA)	W	Se	I	CNS x	2.18	2.21	2.00	2.00	.437	.497	.403	.559
34	Sterling....R. Admiral V-2500-7	M	12-6⅜x6½	....	800-2200	2500.0	6.00	.... (EA)	W	Se	I	CNS x	2.18	2.21	2.00	2.00	.437	.497	.403	.559
35	Thorobred (10)....K	M	1-3¾x4¾	6-1000	5-1000	52.5	4.00	....	N	Se	L	NCI	1.62	1.62	1.43	1.43	.300	.300	.375	.375
36	Thorobred....KK	M	2-3¾x4¾	11-1100	10-1100	105.0	4.00	54-800 (EA)	N	Se	L	NCI	1.62	1.62	1.43	1.43	.300	.300	.375	.375
37	Thorobred....DS	M	4-2¾x4	19-1800	16-1800	95.0	4.66	53-1300 (EA)	N	In	L	Sil	1.46	1.34	1.31	1.18	.250	.250	.312	.312
38	Thorobred....Arrowhead, Jr.	M	4-3¼x4	38-2600	35-2600	133.0	5.58	92-1200 (EA)	N	In	L	Sil	1.34	1.34	1.18	1.18	.281	.281	.312	.312
39	Thorobred....Arrowhead	M	4-3⅝x4½	40-2200	37-2200	186.0	5.50	128-900 (EA)	N	In	L	Sil	1.56	1.56	1.37	1.37	.281	.281	.375	.375
40	Thorobred....AA	M	4-3¾x4¾	27-1400	24-1400	210.0	4.00	113-700 (EA)	N	Se	L	NCI	1.62	1.62	1.43	1.43	.300	.300	.375	.375
41	Thorobred....F	M	4-4 1/16x5	39-1400	36-1400	259.0	4.00	142-1000 (EA)	N	Se	L	NCI	1.93	1.93	1.75	1.75	.300	.300	.375	.375
42	Thorobred....B	M	4-4½x5	47-1800	44-1800	318.0	4.00	180-900 (EA)	N	Se	L	CNS	2.09	2.09	1.93	1.93	.300	.300	.375	.375
43	Thorobred....BB-4	M	4-4½x6	59-1600	56-1600	382.0	4.00	224-1100 (EA)	N	Se	L	Sil	2.34	2.34	2.12	2.12	.300	.300	.437	.437
44	Thorobred....BC-4	M	4-5x7	60-1200	56-1200	550.0	4.00	292-900 (EA)	N	Se	L	Dia	2.75	2.75	2.37	2.37	.375	.375	.625	.625
45	Thorobred....BCS-4	M	4-5¾x7	75-1100	71-1100	727.0	4.00	409-900 (EA)	N	Se	L	Dia	2.75	2.75	2.37	2.37	.375	.375	.625	.625
46	Thorobred....BC-Super-4	M	4-6x7	82-1100	78-1100	791.7	4.00	465-700 (EA)	N	Se	L	Dia	2.75	2.75	2.37	2.37	.375	.375	.625	.625
47	Thorobred....Hiawatha	M	6-3¾x4¼	85-2800	82-2800	282.0	5.70	185-1100 (EA)	N	In	L	Sil	1.68	1.43	1.50	1.25	.375	.375	.375	.375
48	Thorobred....Arrow-Super-6	M	6-4¼x4¾	98-2500	95-2500	404.0	5.38	286-800 (EA)	N	In	L	Sil	1.93	1.43	1.75	1.25	.375	.375	.375	.375
49	Thorobred....BB-6	M	6-4½x6	84-1725	80-1725	572.5	4.00	379-900 (EA)	N	Se	L	Sil	2.34	2.34	2.12	2.12	.300	.300	.437	.437
50	Thorobred....BBS-6	M	6-5x6	105-1500	101-1500	707.0	4.00	420-900 (EA)	N	Se	L	Sil	2.34	2.34	2.12	2.12	.300	.300	.437	.437
51	Thorobred....BC-6	M	6-5x7	94-1100	90-1100	825.0	4.00	452-1000 (EA)	N	Se	L	Dia	2.75	2.75	2.37	2.37	.375	.375	.625	.625
52	Thorobred....BCS-6	M	6-5¾x7	116-1100	112-1100	1091.0	4.00	596-850 (EA)	N	Se	L	Dia	2.75	2.75	2.37	2.37	.375	.375	.625	.625
53	Thorobred....BC-Super-6	M	6-6x7	128-1100	124-1100	1187.5	4.00	630-875 (EA)	N	Se	L	Dia	2.75	2.75	2.37	2.37	.375	.375	.625	.625
54	Universal....Fisherman-WM	M	1-4⅜x4½	....	8-1200	67.6	4.60	....	N	In	L	CNS	1.87	1.87	.....	.....	.250	.250	.375	.375
55	Universal....Blue Jacket-AFTL	M	2-3x3½	....	12-2200	49.5	5.75	....	N	In	L	CNS	1.50	1.50	.....	.....	.250	.250	.375	.375
56	Universal....Utility Four-BN	M	4-2¾x4	....	25-2500	95.0	5.00	....	N	In	L	CNS	1.12	1.12	.....	.....	.234	.234	.312	.312
57	Universal....Flexifour-FA	M	4-3x3½	....	40-3500	99.0	5.00	....	N	In	L	Sil	1.50	1.50	.....	.....	.312	.312	.375	.375
58	Universal....Superfour-LSG	M	4-3¼x4½	....	50-3000	149.3	5.70	....	N	Se	L	CNS	1.37	1.37	.....	.....	.312	.312	.375	.375
59	Universal....American Six-AMS	M	6-3x3½	....	60-3500	148.5	6.00	....	N	In	L	Sil	1.50	1.50	.....	.....	.312	.312	.375	.375
60	Universal....Cruiser Six-HCS	M	6-3½x4½	....	90-3000	260.0	5.75	....	N	Se	L	Sil	1.50	1.50	.....	.....	.312	.312	.375	.375
61	Universal....Sea Lion Six-LHS	M	6-3½x4½	....	110-3400	260.0	5.75	....	N	Se	L	Sil	1.50	1.50	.....	.....	.312	.312	.375	.375
62	Universal....Cruiser Eight-GCE	M	8-3½x4½	....	125-3000	347.0	5.75	....	N	Se	L	Sil	1.50	1.50	.....	.....	.328	.328	.375	.375
63	Universal...Sea Lion Eight-LCE	M	8-3½x4½	....	141-3400	347.0	5.75	....	N	Se	L	Sil	1.50	1.50	.....	.....	.328	.328	.375	.375
64	Waukesha....(12) (H) 150	C, Ind	2-3x2¾	....	11-3200	39.0	5.60	19-2400 (EA)	N	In	L	Sil	1.37	1.12	1.25	1.00	.300	.300	.312	.312
65	Waukesha....(12) ICK	M, Ind	4-2½x3⅛	18-2600	14-2000	61.3	5.70	40-1700 (BE)	N	Se	L	Sil	1.12	.937	1.00	.812	.228	.250	.312	.312
66	Waukesha....(12) FCS	Tr, Ind	4-2¾x4	26-2600	17-1800	94.0	4.85	68-1000 (BE)	N	In	L	Sil	1.34	1.34	1.18	1.18	.281	.281	.312	.312
67	Waukesha....(12) FC	T, Tr, Ind	4-3¼x4	35-2600	25-1800	133.0	5.58	86-1200 (BE)	N	In	L	Sil	1.34	1.34	1.18	1.18	.281	.281	.312	.312
68	Waukesha....(12) 160	Ind	4-3 7/16x3½	27-1800	....	120.5	6.00	85-1200 (BE)	W	In	I	Sil	1.18	1.12	1.06	1.00	.281	.281	.375	.375
69	Waukesha....(12) XAH	T, Ind	4-3⅝x4½	42-2200	33-1800	186.0	5.50	128-900 (BE)	N	In	L	Sil	1.56	1.56	1.37	1.37	.302	.275	.375	.375
70	Waukesha....(12) 130GS	T, Tr, Ind	4-3¾x5	50-2200	36-1500	221.0	6.12	144-800 (BE)	W	In	I	Sil	1.84	1.40	1.62	1.25	.445	.453	.434	.434
71	Waukesha....(12) 130GL	T, Tr, Ind	4-4x5	56-2200	41-1500	251.0	5.95	164-800 (BE)	W	In	I	Sil	1.84	1.40	1.62	1.25	.445	.453	.434	.434
72	Waukesha....(12) VIM	Tr, Ind	4-4¼x5¼	52-1600	45-1400	298.0	4.23	200-1000 (BE)	W	In	I	Sil	2.00	1.75	1.75	1.50	.400	.400	.375	.375
73	Waukesha....(12) VIK	Tr, Ind	4-4½x5¼	58-1600	50-1400	334.0	4.30	224-900 (BE)	W	In	I	Sil	2.00	2.00	1.75	1.75	.400	.400	.375	.375
74	Waukesha....(12) VRZG	T, Tr, Ind	4-4⅝x5¼	64-1600	56-1400	353.0	6.10	241-1100 (BE)	W	In	I	Sil	2.00	1.75	1.75	1.50	.450	.400	.375	.375
75	Waukesha....(11) 6BL	T, B, Ind	6-3½x4¼	72-2800	51-2000	245.0	5.70	165-1300 (BE)	N	In	L	Sil	1.68	1.43	1.50	1.25	.375	.375	.375	.375
76	Waukesha....(11) 6BM	T, B, Ind	6-3⅝x4¼	77-2800	54-2000	263.0	5.70	178-1100 (BE)	N	In	L	Sil	1.68	1.43	1.50	1.25	.375	.375	.375	.375
77	Waukesha....(11) 6BK	T, B, Ind	6-3¾x4¼	82-2800	59-2000	282.0	5.70	189-1100 (BE)	N	In	L	Sil	1.68	1.43	1.50	1.25	.375	.375	.375	.375
78	Waukesha....(11) 6BZ	T, B, Ind	6-4x4¼	86-2800	65-2000	320.0	5.75	210-1000 (BE)	N	In	L	Sil	1.68	1.43	1.50	1.25	.375	.375	.375	.375
79	Waukesha....(11) 6MKR	T, B, Ind	6-4⅛x4¾	98-2500	58-1600	381.0	5.34	270-800 (BE)	N	In	L	Sil	1.93	1.43	1.75	1.25	.375	.375	.375	.375
80	Waukesha....(11) 6MZR	T, B, Ind	6-4¼x4¾	106-2500	66-1600	404.0	5.38	286-800 (BE)	N	In	L	Sil	1.93	1.43	1.75	1.25	.375	.375	.375	.375
81	Waukesha....(11) 140-GS	T, B, Ind	6-4¼x5½	122-2250	114-2250	468.0	5.80	362-1000 (BE)	W	In	I	Sil	2.12	1.56	1.87	1.37	.531	.469	.434	.434
82	Waukesha....(11) 6SRLR	T, B, Ind	6-4⅜x5⅛	112-2250	105-2250	462.0	5.50	330-600 (BE)	N	Se	L	Sil	2.16	1.65	1.87	1.37	.386	.375	.375	.375
83	Waukesha....(11) 140-GK	T, B, Ind	6-4½x5½	136-2250	128-2250	525.0	5.80	403-1000 (BE)	W	In	I	Sil	2.12	1.56	1.87	1.37	.531	.469	.434	.434
84	Waukesha....(11, 6SRKR	T, B, Ind	6-4⅝x5⅛	125-2250	120-2250	517.0	5.50	369-600 (BE)	N	Se	L	Sil	2.16	1.65	1.87	1.37	.386	.375	.375	.375
85	Waukesha....(11) 145-GS	T, B, Ind	6-4¾x6	152-2000	143-2000	638.0	5.60	481-1000 (BE)	W	In	I	Sil	2.37	1.84	2.12	1.62	.594	.531	.500	.500
86	Waukesha....(11) 145-GK	T, B, Ind	6-5¼x6	186-2000	177-2000	779.0	5.60	590-1200 (BE)	W	In	I	Sil	2.37	1.84	2.12	1.62	.594	.531	.500	.500
87	Waukesha....(12) 6WAL	T, B, Ind	6-5⅜x6½	200-1800	162-1300	1013.0	5.00	735-800 (BE)	W	In	I	Sil	2.65	2.22	2.37	2.00	.656	.656	.500	.500
88	Waukesha....(12) 6WAK	T, B, Ind	6-6¼x6½	235-1800	193-1300	1197.0	5.20	865-900 (BE)	W	In	I	Sil	2.65	2.22	2.37	2.00	.656	.656	.500	.500
89	Waukesha....(12) 6EL	Ind	6-6½x7	165-1125	144-1050	1395.0	4.00	1000-550 (BE)	W	In	I	Sil	2.84	2.53	2.50	2.25	.718	.718	.562	.562
90	Waukesha....(12) 6EK	Ind	6-7x7	190-1125	166-1050	1616.0	4.00	1120-550 (BE)	W	In	I	Sil	2.84	2.53	2.50	2.25	.718	.718	.562	.562
91	Waukesha....(12) 6NK	Ind	6-7x8½	221-1050	196-950	1962.0	5.50	1330-600 (BE)	W	In	I	Sil	2.84	2.53	2.50	2.25	.718	.718	.562	.562
92	Waukesha....(12) 6LRO	Ind	6-8½x8½	337-1050	300-900	2894.0	3.80	1870-700 (BE)	N	Se	I	Sil	3.50	3.00	3.25	2.75	.750	.840	.562	.562
93	Waukesha....FCL	Tr,Ind	4-3x4	28-2600	23-2600	113.0	5.75	73-1200	N	In	L	Sil	1.34	1.34	1.18	1.18	.281	.281	.312	.312
94	White....(H) 35A	T	4-3⅝x3½	40-2600	33-2600	145.0	5.70	88-1200 (EA)	N	Se	OH	AUS	1.57	1.22	1.40	1.06	.344	.344	.372	.372
95	White....100A	T, B	6-3 7/16x4½	90-2800	....	250.0	6.75	185-1200 (BE)	N	In	L	AUS	1.65	1.62	1.43	1.50	.381	.381	.375	.375
96	White....110A	T, B	6-3 7/16x4½	100-2600	....	270.0	6.50	200-1300 (BE)	N	In	L	AUS	1.65	1.62	1.43	1.50	.381	.381	.375	.375

(For abbreviations see pages 120-121)

Engines—*Continued*

Valves: Seats: Angle (Deg.)	Valves: Seats: Inserts Used?	Valves: Seats: Insert Material (S.A.E. No.)	Camshaft Drive—Type	Pistons: Material	Pistons: Weight with Pins, Rings, Bushings (Oz.)	Pistons: Piston Pin—Diameter and Length (In.)	Number of Rings per Piston	Connecting Rods: Material	Connecting Rods: Center to Center Length (In.)	Connecting Rods: Weight with Bushing and Cap (Oz.)	Crankshaft: Material	Crankshaft: Counter Balance Used	Crankshaft: Crank-Pin Diameter and Length (In.)	Main Bearings: Number	Main Bearings: Diameter and Length (In.): Front	Main Bearings: Diameter and Length (In.): Rear	Oil Pressure to—	Spark Plug—Thread Size	Carburetor: Make	Carburetor: Size	Engine Weight without Carburetor or Ignition (Lb.)	Overall Dimensions (In.): Width	Overall Dimensions (In.): Height	Overall Dimensions (In.): Length	Line Number
45	......	......	HG	Al	50	1.37x3.84	4	AS	11¼	84	NS	Y	2.87x2.00	4	3.00x3.00	3.00x3.62	ab	18 mm	Sch	1½	1420*	33½	33 7/16	66	1
45	......	......	HG	Al	50	1.37x3.84	4	AS	11¼	84	NS	Y	2.87x2.00	4	3.00x3.00	3.00x3.62	ab	18 mm	Zen	2	1325*	33½	33 7/16	66	2
45	......	......	HG	Al	56	1.37x4.00	4	AS	11¼	84	NS	Y	2.87x2.00	4	3.00x3.00	3.00x3.62	ab	18 mm	Hol	2	1325*	26¼	37 9/16	66	3
45	......	......	HG	Al	56	1.37x4.00	4	AS	11¼	84	NS	Y	2.87x2.00	4	3.00x3.00	3.00x3.62	ab	18 mm	Sch	1½	1420*	33½	33 7/16	66	4
45	......	......	HG	Al	56	1.37x4.00	4	AS	11¼	84	NS	Y	2.87x2.00	4	3.00x3.00	3.00x3.62	ab	18 mm	Hol	2	1325*	33½	33 7/16	66	5
45	......	......	HG	Al	62	1.37x4.00	4	AS	11¼	84	NS	Y	2.87x2.00	4	3.00x3.00	3.00x3.62	ab	18 mm	Hol	2	1325*	26¼	37 9/16	66	6
45	......	......	HG	Al	62	1.37x4.00	4	AS	11¼	84	NS	Y	2.87x2.00	4	3.00x3.00	3.00x3.62	ab	18 mm	Sch	1½	1420*	33½	33 7/16	66	7
45	......	......	HG	Al	56	1.37x4.00	4	AS	11¼	85	CS	Y	2.87x2.25	4	3.00x3.00	3.00x3.62	abr	18 mm	Zen(2)	2	1325*	25	33 7/16	66	8
45	......	......	HG	Al	56	1.37x4.00	4	AS	11¼	85	CS	Y	2.87x2.25	4	3.00x3.00	3.00x3.62	abr	18 mm	Zen(2)	2	1450*	25	33 7/16	66	9
45	Bo	Tun	HG	Al	......	.750x2.84	3	AS	7	17	CS	Y	2.00x1.75	3	2.50x1.37	2.00x1.96	abc	18 mm	Str(2)	1	860*	23½	32⅝	42⅝	10
45	Bo	Tun	HG	CAS	......	.750x2.84	3	DFS	7	18	CAS	Y	2.14x1.75	3	2.50x1.37	2.00x1.96	abc	14 mm	Hol	1	700*	23½	32⅞	43 5/16	11
45	Bo	Tun	HG	CAS	15	.750x2.48	3	DFS	7 11/32	22	CAS	Y	2.12x1.57	4	2.40x1.83	2.40x2.25	abc	14 mm	Str	1	......	25⅜	31⅞	49 13/16	12
45	......	......	HG	Al	49	1.25x3.68	4	AS	10⅞	164½	NS	Y	2.75x2.25	4	3.25x2.25	3.25x2.25	abc	18 mm	Hol	2	1700*	35	33½	58½	13
45	......	......	HG	Al	49	1.25x3.68	4	AS	10⅞	164½	NS	Y	2.75x2.25	4	3.25x2.25	3.25x2.25	abc	18 mm	Str(2)		1700*	33¼	30 7/16	58½	14
45	......	......	HG	Al	49	1.25x3.68	4	AS	10⅞	164½	NS	Y	2.75x2.25	4	3.25x2.25	3.25x2.25	abc	18 mm	Str(2)	2	1700*	33¼	30 7/16	58½	15
45	E	T-12	HG	Al	94	1.43x4.37	4	CS	12½	113	CNS	Y	2.50x2.12	7	3.00x1.75	3.00x2.87	abcdef	⅞-18	Zen(2)	1½	1400	27½	33½	71¾	16
45	E	T-12	HG	Al	94	1.43x4.37	4	CS	12½	113	CNS	Y	2.50x2.12	7	3.00x1.75	3.00x2.87	abcdef	⅞-18	Zen(2)	1½	1400	27½	33½	71¾	17
45	E	T-12	HG	Al	94	1.43x4.37	4	CS	12½	113	CNS	Y	2.50x2.12	7	3.00x1.75	3.00x2.87	abcdef	⅞-18	Zen(2)	1½	1850	27½	33½	71¾	18
45	E	T-12	HG	Al	94	1.43x4.37	4	CS	12½	113	CNS	Y	2.50x2.12	7	3.00x1.75	3.00x2.87	abcdef	⅞-18	Zen(2)	1¾	1400	27½	33½	71¾	19
45	E	T-12	HG	Al	94	1.43x4.37	4	CS	12½	113	CNS	Y	2.50x2.12	7	3.00x1.75	3.00x2.87	abcdef	⅞-18	Zen(2)	1½	2000	27 7/16	23	81 1/16	20
45	E	T-12	HG	Al	94	1.43x4.37	4	CS	12½	113	CNS	Y	2.50x2.12	7	3.00x1.75	3.00x2.87	abcdef	⅞-18	Zen(2)	1¾	2000	27½	33½	71¾	21
45	E	T-12	HG	Al	94	1.43x4.37	4	CS	12½	113	CNS	Y	2.50x2.12	7	3.00x1.75	3.00x2.87	abcdef	⅞-18	Zen(2)	1½	2000	27½	33½	71¾	22
60	N	......	HG	Al	100	1.25x5.12	3	CS	14	130	CNS	Y	2.50x3.00	4	2.50x4.43	2.50x4.43	abcdef	⅞-18	Zen(2)	1¾	2250	30½	45⅛	87½	23
60	N	......	HG	Al	100	1.25x5.12	3	CS	14	130	CNS	Y	2.50x3.00	4	2.50x4.43	2.50x4.43	abcdef	⅞-18	Zen(2)	1¾	2000	30½	45⅛	87½	24
60	N	......	HG	Al	110	1.25x5.12	3	CS	14	130	CNS	Y	2.50x3.00	4	2.50x4.43	2.50x4.43	abcdef	⅞-18	Zen(2)	2½	2175	30½	45⅛	87½	25
45	E	T-12	Ch	Al	280	2.00x7.00	4	CS	18	416	CNS	Y	4.00x3.12	7	4.00x3.37	4.00x5.50	abcdef	⅞-18	Zen(3)	2½	7100	40⅛	72¾	121⅜	26
45	E	T-12	Ch	Al	290	2.00x7.00	4	CS	18	416	CNS	Y	4.00x3.12	7	4.00x3.37	4.00x5.50	abcdef	⅞-18	Zen(3)	2½	7100	40⅛	72¾	121⅜	27
45	E	T-12	Ch	Al	290	2.00x7.00	4	CS	18	416	CNS	Y	4.00x3.12	7	4.00x3.37	4.00x5.50	abcdef	⅞-18	Zen(3)	2½	7100	40⅛	72¾	121⅜	28
45	E	T-12	Ch	Al	280	2.00x7.00	4	CS	18	416	CNS	Y	4.00x3.12	9	4.00x3.37	4.00x5.50	abcdef	⅞-18	Zen(4)	2½	9000	40⅛	72¾	142⅜	29
45	E	T-12	Ch	Al	290	2.00x7.00	4	CS	18	416	CNS	Y	4.00x3.12	9	4.00x3.37	4.00x5.50	abcdef	⅞-18	Zen(4)	2½	9000	40⅛	72¾	142⅜	30
45	E	T-12	Ch	Al	290	2.00x7.00	4	CS	18	416	CNS	Y	4.00x3.12	9	4.00x3.37	4.00x5.50	abcdef	⅞-18	Zen(4)	2½	9000	40⅛	72¾	142⅜	31
45	E	T-12	Ch	Al	......	2.00x7.00	4	CS	18	416	CNS	Y	4.00x3.12	9	4.00x3.37	4.00x5.50	abcdef	⅞-18	Zen(4)	2½	9900	44	64	144½	32
45	Bo	JM	HG	Al	96	1.62x5.90	6	4340	‡‡	48	4140	Y	3.50x2.87	7	4.00x3.00	4.00x3.00	abce	⅝-24	Str	....	4200	50	50	108⅝	33
45	Bo	JM	HG	Al	96	1.62x5.90	6	4340	‡‡	48	4140	Y	3.50x2.87	7	4.00x3.00	4.00x3.00	abce	⅝-24	Str	....	3950	50	50	108⅝	34
45	N	......	HG	CIA	64	1.10x3.25	3	1045	8½	43	1045	N	1.50x2.12	2	1.50x3.00	1.50x3.00	Splash	⅞-18	Str	¾	210	19¼	22 9/16	21⅜	35
45	N	......	HG	CIA	64	1.10x3.25	3	1045	8½	43	1045	N	1.50x2.12	2	1.50x3.00	1.50x3.00	Splash	⅞-18	Str	1	415	19½	22 13/16	38¼	36
45	N	......	HG	CIA	19	.625x2.40	3	1045	8	27	1045	N	1.75x1.50	2	1.76x2.81	1.73x2.87	abe	⅞-18	Str	¾	330	15⅞	21⅛	38⅛	37
45	N	......	HG	CI	30	.875x2.75	3	1045	7¼	29	1045	N	1.75x1.25	3	2.12x1.43	2.12x1.18	abcde	18 mm	Str	1	490	21⅜	24 3/16	35	38
45	E	CA	HG	CI	45	1.10x3.06	4	1045	8¾	46	1045	N	2.00x1.50	3	2.00x2.50	2.00x1.87	abcde	⅞-18	Str	1	610	19⅛	26¼	41	39
45	N	......	HG	CIA	64	1.10x3.25	3	1045	8½	43	1045	N	1.50x2.12	3	1.50x3.00	1.50x3.00	abe	⅞-18	Str	1	620	19½	22 11/16	46⅝	40
45	N	......	HG	CIA	69	1.10x3.56	4	1045	10⅜	66	1045	N	2.00x2.25	3	2.00x4.18	2.00x3.50	abe	⅞-18	Str	1¼	830	20¼	26 11/16	54⅝	41
45	N	......	HG	CIA	89	1.10x3.93	4	1045	10⅜	66	1045	N	2.00x2.25	3	2.00x4.18	2.00x3.50	abe	⅞-18	Str	1½	830	20¼	26 11/16	54⅝	42
45	N	......	HG	CIA	82	1.25x3.87	4	1045	11⅜	87	1045	N	2.56x2.25	5	2.56x4.25	2.56x4.25	abce	⅞-18	Str	1½	1175	22¾	27 1/16	59 1/16	43
45	N	......	HG	CIA	126	1.43x4.68	4	1045	13¼	168	1045	N	2.56x3.00	5	2.62x4.50	2.62x4.50	abcde	⅞-18	Str	2	1720	25⅞	37⅝	74 1/16	44
45	N	......	HG	CIA	150	1.43x5.25	4	1045	13¼	168	1045	N	2.56x3.00	5	2.62x4.50	2.62x4.50	abcde	⅞-18	Str	2	1730	25⅞	37⅝	74 1/16	45
45	N	......	HG	CIA	190	1.43x5.50	4	1045	13¼	168	1045	N	2.56x3.00	5	2.62x4.50	2.62x4.50	abcde	⅞-18	Str	2	1740	25⅞	37⅝	74 1/16	46
45	E	CA	HG	Al	37	1.00x3.50	4	1045	8	40	1045	N	2.00x1.50	7	2.62x2.00	2.62x1.25	abcde	18 mm	Str	1¼	1000	22½	28¼	53 11/16	47
45	E	CA	HG	Al	48	1.00x4.00	4	1045	8¾	48	1045	N	2.25x1.50	7	2.62x2.75	2.62x1.62	abcde	14 mm	Str	1¼	1185	20¼	27⅞	57 11/16	48
45	N	......	HG	CIA	82	1.25x3.87	4	1045	11⅜	87	1045	N	2.56x2.25	7	2.56x4.25	2.56x4.25	abce	⅞-18	Str	1½	1475	23⅜	33¼	72 1/16	49
45	N	......	HG	CIA	106	1.25x4.31	4	1045	11⅜	87	1045	N	2.56x2.25	7	2.56x4.25	2.56x4.25	abce	⅞-18	Str	2	1565	24⅛	33¼	72¾	50
45	N	......	HG	CIA	126	1.43x4.68	4	1045	13¼	168	1045	N	2.56x3.00	7	2.62x4.50	2.62x4.50	abcde	⅞-18	Str	2	2330	27⅛	37⅝	91⅝	51
45	N	......	HG	CIA	150	1.43x5.25	4	1045	13¼	168	1045	N	2.56x3.00	7	2.62x4.50	2.62x4.50	abcde	⅞-18	Str	2	2360	27⅛	37⅝	91⅝	52
45	N	......	HG	CIA	190	1.43x5.50	4	1045	13¼	168	1045	N	2.56x3.00	7	2.62x4.50	2.62x4.50	abcde	⅞-18	Str	2	2380	27⅛	37⅝	91⅝	53
45	N	......	HG	CI	......	1.00x3.75	3	Al	8½	......	CS	Y	2.00x2.00	2	2.00x2.00	2.00x2.00	Splash	18 mm	Str	⅝	200	15 3/16	24⅝	17 5/16	54
45	N	......	HG	Als	15	.750x2.56	4	CS	7¼	26	CS	Y	1.75x1.37	2	1.75x1.87	1.75x2.00	abce	18 mm	Zen	⅝	300	20 1/16	22⅝	28 1/16	55
45	N	......	HG	CI	19	.625x2.44	3	CS	7½	22	CS	N	1.50x1.75	2	1.50x2.75	1.50x2.75	abce	18 mm	Zen	1	347	17 1/16	21 1/16	34 1/16	56
45	N	......	HG	Al	15	.750x2.56	4	Al	7¼	18	CS	Y	1.75x1.37	2	1.75x2.50	1.75x2.50	abce	18 mm	Zen	1	400	19 1/16	22⅝	34 1/16	57
45	N	......	HG	Al	20	.875x2.75	4	Al	8½	30	CS	N	2.00x1.75	3	2.00x2.50	2.00x2.50	abc	18 mm	Zen	1	520	18½	25¼	39⅝	58
45	N	......	HG	Al	15	.750x2.56	4	Al	7¼	18	CS	Y	1.75x1.37	4	1.75x2.50	1.75x2.50	abce	18 mm	Zen	1¼	515	24	20¾	43⅝	59
45	N	......	HG	Al	28	.875x3.00	4	Al	8½	28	CS	N	2.00x1.87	7	2.00x2.56	2.00x2.56	abce	18 mm	Str	1¼	775	20 1/16	26¾	49 1/16	60
45	N	......	HG	Al	28	.875x3.00	4	Al	8½	28	CS	N	2.00x1.87	7	2.00x2.56	2.00x2.56	abce	18 mm	Str(2)	1¾	810	22 1/16	26¾	49 1/16	61
45	N	......	HG	Al	28	.875x3.00	4	Al	8½	28	CS	N	2.00x1.87	9	2.00x2.56	2.00x2.56	abce	18 mm	Str	1¾	1050	21 1/16	26 1/16	62⅝	62
45	N	......	HG	Al	28	.875x3.00	4	Al	8½	28	CS	N	2.00x1.87	9	2.00x2.56	2.00x2.56	abce	18 mm	Str(2)	1½	1100	22¾	26 1/16	62⅝	63
45	N	......	HG	CI	......	.625x2.62	4	1045	4⅝	12	1045	Y	1.50x1.00	2	1.50x1.00	2.25x2.31	abcde	14 mm	Op	⅝	125	20¾	14½	16⅝	64
45	N	......	HG	Al	8	.625x2.12	4	1045	6	14	1045	N	1.56x1.25	2(9)	ND1207	ND1207	abcde	14 mm	Op	⅝	143	14 11/16	20½	21 11/16	65
45	E	CA	HG	CI	26	.875x2.25	4	1045	7¼	29	1045	N	1.75x1.06	3	2.12x1.18	2.12x1.43	abcde	18 mm	Op	1	280	19	26¾	27¾	66
45	E	CA	HG	CI	30	.875x2.75	4	1045	7¼	29	1045	N	1.75x1.06	3	2.12x1.18	2.12x1.43	abcde	18 mm	Op	1	290	19	26¾	27¾	67
45	N	......	HG	CI	43	.875x2.68	5	1045	6	28	1045	N	2.00x1.37	3	2.25x1.62	2.25x1.62	a	18 mm	Op	1	335	17¼	25⅜	28½	68
45	E	CA	HG	CI	45	1.12x3.03	4	1045	8¾	46	1045	N	2.00x1.50	3	2.00x1.87	2.00x2.50	abcde	⅞-18	Op	1	385	17⅞	27	32⅞	69
(h)	E	CA	HG	CI	58	1.12x3.06	4	1045	8¾	57	1045	N	2.25x1.75	3	2.62x1.75	2.62x2.25	abcdeg	18 mm	Op	1¼	670	21½	38¾	33 9/16	70
(h)	E	CA	HG	CI	69	1.12x3.31	4	1045	8¾	57	1045	N	2.25x1.75	3	2.62x1.75	2.62x2.25	abcdeg	18 mm	Op	1¼	680	21½	38¾	33 9/16	71
45	E	CA	HG	CI	76	1.31x3.87	4	1045	10½	86	1045	N	2.37x2.12	3	2.37x2.12	2.37x2.75	abcdeg	⅞-18	Op	1¼	875	21¼	35	37⅞	72
45	E	CA	HG	CI	85	1.31x4.06	4	1045	10½	86	1045	N	2.37x2.12	3	2.37x2.12	2.37x2.75	abcdeg	⅞-18	Op	1¼	925	21¼	35	37⅞	73
45	E	CA	HG	CI	96	1.31x4.06	4	1045	10½	85	1045	N	2.37x2.12	3	2.37x2.31	2.37x2.75	abcdeg	18 mm	Op	1¼	1025	20¼	37 11/16	39 9/16	74
45	E	CA	HG	Al	32	1.00x3.12	4	1045	8	40	1045	N	2.00x1.50	7	2.62x1.25	2.62x2.00	abcde	18 mm	Op	1¼	675	19¼	31	39½	75
45	E	CA	HG	Al	34	1.00x3.25	4	1045	8	40	1045	N	2.00x1.50	7	2.62x1.25	2.62x2.00	abcde	18 mm	Op	1¼	685	19¼	31	39½	76
45	E	CA	HG	Al	37	1.00x3.50	4	1045	8	40	1045	N	2.00x1.50	7	2.62x1.25	2.62x2.00	abcde	18 mm	Op	1½	690	19¼	31	39½	77
45	E	CA	HG	Al	46	1.00x3.85	4	1045	8	40	1045	N	2.00x1.50	7	2.62x1.25	2.62x2.00	abcde	18 mm	Op	1½	706	19¼	31	39½	78
45	E	CA	HG	Al	45	1.00x3.85	4	1045	8¾	45	1045	N	2.25x1.50	7	2.62x1.62	2.62x2.75	abcde	18 mm	Op	1½	890	20⅞	34¾	43 11/16	79
45	E	CA	HG	Al	45	1.00x4.00	4	1045	8¾	48	1045	N	2.25x1.50	7	2.62x1.62	2.62x2.75	abcde	18 mm	Op	1¾	920	20⅞	34¾	43 11/16	80
(h)	E	CA	HG	Al	60	1.37x3.62	4	1045	10¼	85	1045	N	2.62x2.00	7	3.25x1.75	3.25x3.00	abcdeg	18 mm	Op	1¾	1350	23⅝	41 13/16	50⅜	81
30	E	CA	HG	Al	89	1.37x4.00	4	1045	10¼	83	1045	N	2.75x1.75	7	3.00x1.87	3.00x3.00	abcde	⅞-18	Op	1¾	1185	24⅛	39⅛	46 9/16	82
(h)	E	CA	HG	Al	64	1.37x3.87	4	1045	10¼	85	1045	N	2.62x2.00	7	3.25x1.75	3.25x3.00	abcdeg	18 mm	Op	1¾	1390	23⅝	41 13/16	50⅜	83
30	E	CA	HG	Al	70	1.37x4.25	4	1045	10¼	83	1045	N	2.75x1.75	7	3.00x1.87	3.00x3.00	abcde	⅞-18	Op	1¾	1225	24⅛	39⅜	46 9/16	84
(h)	E	CA	HG	Al	......	1.62x4.37	4	1045	11¾	133	1045	N	3.00x2.25	7	3.50x2.00	3.50x3.50	abcdeg	18 mm	Op	2	1900	25¾	46⅜	55 11/16	85
(h)	E	CA	HG	Al	103	1.62x4.87	4	1045	11¾	133	1045	N	3.00x2.25	7	3.50x2.00	3.50x3.50	abcdeg	18 mm	Op	2	1930	25¾	46⅜	55 11/16	86
(h)	E	CA	HG	CI	262	1.87x5.00	4	1045	13¼	195	1045	N	3.37x2.37	7	4.00x2.56	4.00x3.56	abcdeg	18 mm	Op	2½	3000	30⅝	50⅞	65⅝	87
(h)	E	CA	HG	CI	292	1.87x5.50	4	1045	13¼	195	1045	N	3.37x2.37	7	4.00x2.56	4.00x3.56	abcdeg	18 mm	Op	2½	3050	30⅝	50⅞	65⅝	88
(h)	E	CA	HG	CI	......	2.00x6.00	4	1045	15⅜	314	1045	N	3.25x2.75	7	3.75x3.75	3.75x5.50	abcdeg	18 mm	Op	2½	5675	31 13/16	60⅝	76	89
(h)	E	CA	HG	CI	304	2.00x6.00	4	1045	15⅜	314	1045	N	3.25x2.75	7	3.75x3.75	3.75x5.50	abcdeg	18 mm	Op	2½	5700	31 13/16	60⅝	76	90
(h)	E	CA	HG	CI	304	2.00x6.00	4	1045	15⅜	314	1045	N	3.25x2.75	7	3.75x3.75	3.75x5.50	abcdeg	18 mm	Op	2½	5900	31 13/16	61 13/16	76	91
30	E	CA	HG	CI	776	2.25x7.75	5	1045	18⅜	474	1045	N	4.00x3.75	7	4.25x4.81	4.25x5.50	abcdeg	⅞-18	Op(2)	2½	10640	48½	65	95⅛	92
45	E	CA	HG	CI	112	.875x2.50	4	1045	7¼	29	1045	N	1.75x1.06	3	2.12x1.18	2.12x1.43	abcde	18 mm	Op	1	285	19	26¾	27¾	93
30	E	AS	HG	CI	37	.859x3.15	4	3140	6	24	1050	Y	2.25x1.43	3	2.25x1.50	2.25x1.83	abc	14 mm	Zen	1¼	475	38	25	32	94
45	E	AS	HG	Al	38	1.00x3.03	5	1040	9 15/32	40	1050	Y	2.18x1.34	7	3.00x1.84	3.00x1.93	abcde	14 mm	Str	1¼	973	29⅜	40⅝	44¼	95
45	E	AS	HG	Al	43	1.00x3.03	5	1040	9 15/32	52	1050	Y	2.18x1.34	7	3.00x1.84	3.00x1.93	abcde	14 mm	Str	1¼	973	29⅜	40⅝	44¼	96

(For abbreviations see pages 120-121)

American Gasoline

Line Number	ENGINE MAKE AND MODEL	Designed for	Number of Cylinders, Bore and Stroke (In.)	MAXIMUM BRAKE Hp. at Specified R.P.M.: With Bare Engine	With Standard Accessories	Piston Displacement (Cu. In.)	Compression Ratio	Maximum Torque at R.P.M. (Lb. Ft.) with or without Accessories	Cylinder Liners—Type	Crankcase—Upper Half Integral with Cylinders	VALVES: Arrangement	Exhaust Head Material (S.A.E. No.)	Max. Head Diameter (In.): Intake	Max. Head Diameter (In.): Exhaust	Min. Port Diameter (In.): Intake	Min. Port Diameter (In.): Exhaust	Lift (In.): Intake	Lift (In.): Exhaust	Stem Diameter (In.): Intake	Stem Diameter (In.): Exhaust
1	White.....120A	T, B	6-3⅞x4½	110-2600	......	318.0	6.40	285-1200 (BE)	N	In	L	AUS	1.65	1.62	1.43	1.50	.381	.381	.375	.437
2	White.....140A	T, B	6-3⅞x5⅛	125-2600	......	362.0	6.28	285-1100 (BE)	N	In	L	AUS	1.65	1.62	1.75	1.50	.381	.381	.375	.437
3	White.....(H) 140TA	B	6-3⅞x5⅛	......	125-2800	362.0	6.28	250-1200 (BE)	N	In	L	AUS°x	......	......	1.75	1.50	.375	.381	......	......
4	White.....(H) 24A	B	12-4⅛x4¼	......	209-2600	681.0	6.10	500-1200 (BE)	D	In	L	AUS°	......	......	1.62	1.62	.375	.375	......	......
5	Willys.....442	C, T	4-3⅛x4⅜	63-3900	......	134.2	6.48	108-1800 (BE)	N	In	L	CNS	1.53	1.46	1.34	1.28	.359	.359	.373	.373
6	Wisconsin.....AK	M, Tr, Ind	1-2⅞x2¾	4.2-2400	4.2-2400	17.8	4.59	9.5-1700 (EA)	N	In	L	AUS	1.12	1.12	.937	.937	.187	.187	.310	.310
7	Wisconsin.....AHH	M, Tr, Ind	1-3⅝x4	9.2-2200	9.2-2200	41.3	4.50	26-1300 (EA)	N	Se	L	Sil	1.56	1.56	.812	1.25	.275	.275	.310	.310
8	Wisconsin.....AC-4	Tr, Ind	4-2⅝x3¼	16-2600	16-2600	70.4	4.60	39.5-1600 (EA)	N	Se	I	Sil	1.12	1.12	.937	.937	.232	.232	.310	.310
9	Wisconsin.....VE-4	M, Tr, Ind	4-3x3¼	22-2600	22-2600	91.9	4.60	50-1700 (EA)	N	Se	L	AUS	1.31	1.31	1.12	1.12	.275	.275	.310	.310
10	Wisconsin.....AM-4	Tr, Ind	4-3¼x4	25-2200	25-2200	132.0	4.56	79-1300 (EA)	N	Se	I	Sil	1.50	1.37	1.12	1.12	.276	.256	.310	.310
11	Wisconsin.....AP-4	Tr, Ind	4-3½x4	32-2100	32-2100	154.0	4.60	94-1100 (EA)	N	Se		Sil	1.50	1.37	1.12	1.12	.276	.256	.310	.310
12	Wisconsin.....VF-4	M,T,Ind	4-3¼x3¼	25-2400	25-2400	107.7	4.60	57-1600	N	Se	L	AUS	1.31	1.31	1.12	1.12	.275	.275	.310	.310
13	Wisconsin.....	......	For other	engines	see SMA	LL GA	SOLI	NE POWER U	NI	TS	tab	le								

ABBREVIATIONS

§—Used in Bus engines; no liners used in truck engines
°—Stellite faced
•—Weight complete with ignition and carburetor
••—Pressure also to Camshaft thrust bearing
■—Also available in reduction gear models
▾—Also available in R.H. rotation
‡—Tocco hardened
♠—Weight per pair
†—Rated with generator and water pump, but no fan or muffler
††—1500 lbs. for model 179; model 178 includes reduction gear and weighs 1905 lbs. complete
‡—Super-Charged engine

‡‡—8¾ in. for link rod; 12 in. for master rod
(1)—6.20 ratio for Cars, 5.90 for heavy duty truck engine
(2)—Two used
(3)—Three used
(4)—Four used
(5)—156 ft. lb. torque at 2200 for cars; 156 ft. lb. at 2000 for heavy duty truck engine
(6)—41¾ in. for 178 model; 36⅞ in. for 179 model
(7)—76$\frac{1}{16}$ in. for 178 model; 62⅝ in. for 179 model
(8)—Minneapolis Moline Power Implement Co.
(9)—Ball Bearings
(10)—Red Wing Motor Co.

(11)—Automotive Power Ratings
(12)—Industrial Power Ratings
a—Main Bearings
(aa)—Forked rod, 88 oz.; Plain Rod, 50 oz.
Al—Aluminum Alloy
Ala—Aluminum Alloy, Anodized
Als—Aluminum Alloy with Steel Strut
AS—Alloy Steel
AUS—Austenitic Steel B—Buses
Ay—Alloy Iron
b—Connecting Rods (BE)—Bare Engine
BG—Bevel Gear
Bo—Used in both Intake and Exhaust seats
c—Camshaft Bearings C—Cars
CA—Cast Alloy

Car—Carter Carburetor
CAS—Cast Alloy Steel
Ch—Chain
CHS—Chrome Nickel Silicon Steel
CI—Cast Iron
CIA—Cast Iron, Anodized
CM—Chrome Molybdenum
CNI—Chrome Nickel Iron
CNM—Chrome Nickel Molybdenum
CNS—Chrome Nickel Steel
CNT—Chrome Nickel Steel with Tungsten
CS—Carbon Steel
CT—Cast Iron, Tin plated
d—Wrist Pins D—Dry Liners
DC—Durachrome Casting

ABBREVIATIONS FOR AIRCRAFT ENGINES

For Complete Specifications See Pages 110 and 111

General

‡—Based on Maximum Horsepower
*—Optional
°—Fuel Injection system optional
▲—Applies to model with .667 Reduction Gear
■—Gear drive engines also available at same ratings
†—Basic commercial models released for domestic and export sale—representative of corresponding military models in current production
♠—May be equipped with two speed supercharger
(a)—Combination Battery and Magneto optional
(b)—One Magneto, one Battery
(c)—Fuel Injection type carburetor with automatic mixture control and idle cut-off
(d)—Two speed blower, ratios not available
(e)—75% Power allowable
(f)—Two speed blower, ratios; 7.00 and 7.40:1
(g)—Two speed blower, ratios; 7.14 and 10.00:1
H—High Blower
(h)—Duplex

L—Low Blower
Liq—Liquid cooled Mil—Military

Cylinder Arrangement

Hor—Horizontal Opposed
IV-L—Inverted-In-Line
IV-V—Inverted-V-Type
(k) by 12⅛
(n) by 8⅛
Pen—Pending
Rad—Radial
V-60—V-Type-60 Degrees

Cylinder Material

(1)—Nickel Iron with Aluminum Head
(2)—Aluminum with Steel Liner
(3)—Cast Iron
(4)—Cast Iron with Aluminum Head
(5)—Steel with Aluminum Head
(6)—Aluminum with cast iron liner

Valve Location

I—In head with push rods and rocker arms
L—Valves at side. "L" Head
OH—Overhead Camshaft

Rating

SL—Sea Level

Propeller Drive

D—Direct G—Geared

Carburetor Make

Hol—Holley Lin—Linkert
MS—Marvel-Schebler
SCH—Stromberg, Chandler-Evans or Holley
SH—Stromberg or Holley
SM—Stromberg or Marvel-Schebler
Str—Stromberg
Zen—Zenith

Ignition System Make

Bos—Bosch ES—Edison-Splitdorf
BS—Bendix-Scintilla Scin—Scintilla
SES—Scintilla, Edison-Splitdorf or Superior
Eis—Eisemann

Current Sources

B. M.—Battery and Magneto
Bat—Battery Mag—Magneto

Starter Make

Au—Auto-Lite
Co—Coffman Opt—Optional
Ecl—Eclipse
DR—Delco-Remy

Method of Starting

CEH—Compressed Air, Electric Motor or Hand Crank from Machine
CS—Cartridge starting
DE—Direct Cranking Electric
EM—Electric Motor
HE—Hand Crank or Electric Motor
PE—Propeller Swing or Electric Motor
PS—Propeller Swing

Engine Manufacturers

(1)—Aircooled Motors Corp.
(2)—Rearwin Aircraft & Engine, Inc.
(3)—Aviation Mfg. Corp.

Engines—*Concluded*

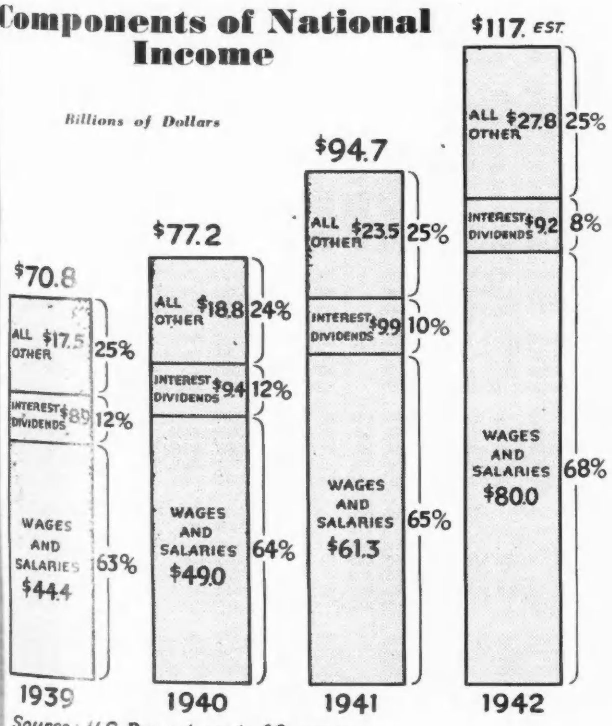
Valve Stem Diameter (In.) — Exhaust	VALVES — Seats — Angle (Deg.)	Inserts Used?	Insert Material (S.A.E. No.)	Camshaft Drive—Type	PISTONS — Material	Weight with Pins, Rings, Bushings (Oz.)	Piston Pin—Diameter and Length (In.)	Number of Rings per Piston	CONNECTING RODS — Material	Center to Center Length (In.)	Weight with Bushing and Cap (Oz.)	CRANKSHAFT — Material	Counter Balance Used	Crank-Pin — Diameter and Length (In.)	MAIN BEARINGS — Number	Diameter and Length (In.) — Front	Diameter and Length (In.) — Rear	Oil Pressure to—	Spark Plug—Thread Size	CARBURETOR — Make	Size	Engine Weight without Carburetor or Ignition (Lb.)	OVERALL DIMENSIONS (In.) — Width	Height	Length	Line Number
.437	45	E	AS	HG	Al	45	1.00x3.46	5	1040	9 11/32	52	1050	Y	2.18x1.34	7	3.00x1.84	3.00x1.93	abcde	14 mm	Str	1¼	993	29⅝	40⅝	44¼	1
.437	45	E	AS	HG	Al	45	1.00x3.46	5	1040	9 11/32	52	1040	Y	2.18x1.34	7	3.00x1.84	3.00x1.93	abcde	14 mm	Str	1¼	1051	29⅝	40⅝	44¼	2
....	45	E	St	HG	Al	45	1.00x3.46	5	....	9 11/32	52	......	Y	2.18x1.34	7	3.00x1.84	3.00x1.93	abcdef	14 mm	Str	1¼	1280*	.....	.....	.....	3
....	....	E	CNM	HG	Al	30	1.18x-.—	5	....	8 1/32	....	......	Y	2.43x2.31	7	2.87x2.09	2.87x2.40	abcdef	14 mm	Zen	....	2275*	.....	.....	.....	4
.373	45	N	N	Ch	CI	24	.812x2.78	3	MS	9 1/16	34	1040	Y	1.94x1.30	3	2.33x1.92	2.33x1.75	abce	14 mm	Car	1¼	364	19	26⅜	26¼	5
.310	45	E	Mo	HG	Al	10	.625x2.37	4	Al	6	6	1045	Y	1.00x1.00	2	(9)	(9)	....	18 mm	Str	⅝	70*	17¾	16¾	15	6
.310	45	Bo	Mo	HG	Al	26	.937x3.00	4	1035	9½	33	1045	Y	1.37x1.37	2	(9)	(9)	....	18 mm	Str	1	180*	18⅞	24⅜	18⅛	7
.310	45	Bo	Mo	HG	CI	14	.875x2.17	4	1035	8⅜	21	1045	Y	1.75x1.12	2	(9)	(9)	g	18 mm	Str	¾	230*	17	28¼	29	8
.310	45	Bo	Mo	HG	CI	22	.750x2.56	4	1035	8⅜	21	1045	N	1.37x1.12	2	(9)	(9)	....	18 mm	Str	⅞	285*	21½	25½	25⅝	9
.310	45	Bo	Mo	HG	CI	30	.937x2.75	4	1035	8⅜	29	1045	N	1.75x1.25	3	(9)	(9)	ag	18 mm	Str	1	340*	20	29	36⅝	10
.310	45	Bo	Mo	HG	CI	35	.937x2.75	4	1035	8⅜	29	1045	N	1.75x1.25	3	(9)	(9)	ag	18 mm	Str	1	345*	20	29	36⅝	11
.310	45	Y	MI	HG	CI	88	.750x2.56	4	1045	8⅜	21	1045	N	1.37x1.12	2	Timken	Roller	Splash	18 mm	Str	⅞	285*	21½	25½	25⅞	12
																										13

ABBREVIATIONS—Cont.

DFS—Drop Forged Steel
Dia—Diachrome
Dur—Duralumin
e—Timing Gears or Chain
E—Used on Exhaust valve seats
(EA)—Engine with Standard Accessories
f—Accessories drive
Fa—Fire Apparatus.
F—In Head and Side ("F" Head)
FA—Fire Apparatus
g—Rocker Arms and Shafts
(h)—Intake 30°, Exhaust 45°
(H)—Horizontal Motor
HC—Helical Gear and Chain
HG—Helical Gear
HH—Horizontal in Head (Valves)
Hol—Holley Carburetor
HS—High Speed Steel
I—In Head (Valves)
In—Integral
Ind—Industrial
JM—Jadson 1-S material
(k)—Intake 30°, Exhaust 44°
L—Valves at Side (L-Head)
M—Marine
MA—Molybdenum Alloy
MI—Moly Iron
ML—Mechanical Lubricator System
Mo—Molybdenum
MS—Manganese Steel
N—No or none
NCI—Nickel Cast Iron
NS—Nickel Steel
Op—Optional
Pro—Proferal
r—Reverse Gear
RC—Rail Cars
SA—Special Alloy
SB—Spiral Bevel Gear
Sch—Schebler Carburetor
Se—Separate
SG—Spur Gear
Sho—Shore Carburetor
Sil—Silcrome Steel
Spec—Special
SS—Semi-Steel
St—Stellite Steel
Str—Stromberg Carburetor
t—Tappets and Valve Mechanism
T-12—Thompson Products No. 12
T—Valves Opposite (T-Head)
T—Trucks
TA—Tungsten Alloy
Til—Tillotson Carburetor
Tr—Tractors
Tun—Tungsten Steel
W—Wet Liners
WA—Wausau Alloy
WR—Wilcox-Rich-EA5
(x)—Sodium Cooled
Y—Yes
Zen—Zenith Carburetor

Components of National Income

Billions of Dollars



Source: U.S. Department of Commerce

National Income Payments

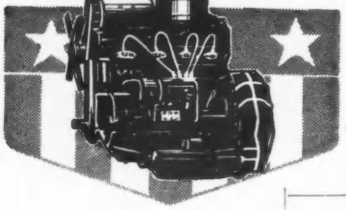
Annual Rate in Billions of Dollars

1942	December	November	October
Total Income Payments*	$127.9	$125.2	$118.0
Nonagricultural Income	112.4	110.5	105.0
Agricultural Income†	15.5	14.7	13.0
1941			
Total Income Payments*	$102.0	$98.3	$98.0
Nonagricultural Income	91.6	88.8	88.0
Agricultural Income†	10.4	9.5	10.0
1940			
Total Income Payments*	$81.5	$79.1	$79.0
Nonagricultural Income	74.9	72.7	72.0
Agricultural Income†	6.6	6.4	7.0

*—Income payments include salaries and wages, dividends and interest, entreprenurial income, net rents and royalties, and relief and insurance payments.

†—Includes net income of farm operators, wages of farm labor, and interest and net rents on agricultural property.

Source—Department of Commerce.



AUTOMOTIVE DIESEL

Line Number	Engine Make and Model	Built Under License from	GENERAL: Designed for	Type	Number of Cylinders Bore and Stroke (In.)	Cylinder Liners—Type	Cycle	Piston Displacement (Cu. In.)	With Bare Engine: Maximum Brake Hp. at Specified R.P.M.	With Standard Accessories: Max. Intermittent Hp. at Specified R.P.M.	With Standard Accessories: Continuous Sustained Hp. at Specified R.P.M.	Compression Ratio - to 1	Max. Combustion Pressure (Lb. per Sq. In.)	B.M.E.P. at Continuous Hp. (Lb. per Sq. In.)	Weight per Continuous Hp. (Lb.)	Max. Torque in Lb. Ft. at Specified R.P.M.	Shipping Weight (Lb.): Automotive or Industrial	Shipping Weight (Lb.): Marine	VALVES: Arrangement	Intake Port Diameter and Lift (In.)	Exhaust Port Diameter and Lift (In.)
1	Atlas Imperial...1LN29	Lanova	I	AC	1-3½x3¾	W	4	29	6.5-1800	5.7-1800	5-1800	15.50	750	76	72.8♦	15-1100	364		VI	1.06-	.96-
2	Atlas Imperial...3LN29	Lanova	I	AC	3-3½x3¾	W	4	87	20-1800	16.5-1800	15-1800	15.50	750	76	40.3♦	45-1100	604		VI	1.06-	.96-
3	Buda........4-DT-212	Lanova	C,T,Tr,R	AC	4-3⅜x5⅛	D	4	212	60.5-2300	49-2300	37-1800	14.50	725	77	25.7♦	123.5-1400	950		VI	1.37-	1.18-
4	Buda........4-DTM-212	Lanova	M	AC	4-3⅜x5⅛	D	4	212	60.5-2300	50-2100	40-1800	14.50	725	83	24.6	132-1400		985	VI	1.37-	1.18-
5	Buda........4-DT-226	Lanova	C,T,Tr,R	AC	4-3¾x5⅛	D	4	226	58.5-2000	48-2000	39-1800	14.50	725	76	24.3♦	132-1400	950		VI	1.37-	1.18-
6	Buda........6-DT-278	Lanova	C,T,Tr,B	AC	6-3⅝x4½	D	4	278	82-2600	69-2600	47-1800	14.50	725	74	23.5♦	161.8-1500	1105		VI	1.37-	1.18-
7	Buda........6-DT-294	Lanova	C,T,Tr,B	AC	6-3⅝x4¾	D	4	294	85-2400	71-2400	51-1800	14.50	725	76	21.9♦	177-1500	1115		VI	1.37-	1.18-
8	Buda........6-DT-317	Lanova	C,T,Tr,B	AC	6-3⅝x5⅛	D	4	317	90-2300	75-2300	52.5-1800	14.50	725	73	21.6♦	185.4-1500	1133		VI	1.37-	1.18-
9	Buda......6-DTM-317	Lanova	M	AC	6-3⅝x5⅛	D	4	317	90-2300	75-2100	56-1800	14.50	725	78	22.3	195-1500		1250	VI	1.37-	1.18-
10	Buda........6-DT-389	Lanova	T,Tr,B	AC	6-3⅞x5½	D	4	389	96-2100	74.5-2100	57-1600	14.20	725	73	24.5♦	222.5-1100	1400		VI	1.44-	1.31-
11	Buda........6-DT-468	Lanova	T,Tr,B	AC	6-4¼x5½	D	4	468	113-2000	89-2000	68-1600	14.20	725	72	21.1♦	268.5-1100	1435		VI	1.59-	1.37-
12	Buda......6-DTM-468	Lanova	M	AC	6-4¼x5½	D	4	468	113-2000	97-1800	75-1600	14.20	725	79	23.7	308-1100		1775	VI	1.59-	1.37-
13	Buda........6-DH-691	Lanova	T,Tr,R	AC	6-4¾x6½	D	4	691	150-1800	123-1800	81-1200	13.70	725	77	28.0♦	404-1100	2270		VI	1.72-	1.56-
14	Buda......6-DHM-691	Lanova	M	AC	6-4¾x6½	D	4	691	150-1800	125-1600	92-1300	13.70	725	81	29.3	432-1100		2700	VI	1.72-	1.56-
15	Buda........6-DH-909	Lanova	Tr,R,I	AC	6-5¼x7	W	4	909	169-1500	143-1500	107-1200	13.60	725	77	30.4♦	534- 900	3250		VI	1.90-	1.78-
16	Buda......6-DHM-909	Lanova	M	AC	6-5¼x7	W	4	909	169-1500	152-1500	117-1200	13.60	725	85	28.6	569- 900		3350	VI	1.90-	1.78-
17	Buda.......6-D-H1611	Lanova	R,I	AC	6-6¼x8¾	W	4	1611	217-1100	176-1100	135- 900	13.00	725	75	50.9♦	917- 650	6875		VI	2.25-	2.02-
18	Buda.......6-D-H1742	Lanova	R,I	AC	6-6½x8¾	W	4	1742	234-1100	192-1100	146- 900	13.00	725	74	47.3♦	991- 650	6900		VI	2.37-	2.12-
19	Buda.......6-D-H1879	Lanova	R,I	AC	6-6¾x8¾	W	4	1879	248-1100	203-1100	155- 900	13.00	725	73	44.8♦	1043- 650	6950		VI	2.50-	2.16-
20	Buda.....6-DHM-1879	Lanova	M	AC	6-6¾x8¾	W	4	1879	248-1100	222-1100	186-1000	13.00	725	78	34.9	1140- 650		6500	VI	2.50-	2.16-
21	Buda.....6-PH-D1879	Lanova	I	AC	6-6¾x8¾	W	4	1879	248-1100	203-1100	155- 900	13.00	725	73	58.1♦	1043- 650	9000		VI	2.50-	2.16-
22	Caterpillar.....D-17000	Own	M,I,R	PC	8-5¾x8	W	4	1662	‡190-1000	152-1000	136-1000			65	58.9♦	1042- 700	8000	7750	VI		
23	Caterpillar.....D-13000	Own	Tr,M,R,I	PC	6-5¾x8	W	4	1246	‡150-1000	128-1000	115-1000			73	48.8♦	842- 800	5610	5650	VI		
24	Caterpillar......D-8800	Own	Tr,M,I	PC	4-5¾x8	W	4	831	‡102-1000	88-1000	79-1000			75	55.7♦	561- 800	4400	4550	VI		
25	Caterpillar......D-4600	Own	Tr,M,I	PC	6-4¼x5½	W	4	468	‡ 82-1600	69-1600	62-1600			66	48.4♦	300-1100	3000	3130	VI		
26	Caterpillar......D-4400	Own	Tr,M,I	PC	4-4¼x5½	W	4	312	‡ 55-1600	46-1600	41-1600			65	58.5♦	194-1100	2400	2430	VI		
27	Caterpillar......D-3400	Own	Tr,M,I	PC	4-3¾x5	W	4	221	‡ 34-1650	28.2-1650	25.2-1650			54	75.0♦	127-1100	1890	1930	VI		
28	Cooper-Bessemer(1)EN		M,R,I	DI	8-8x10½	W	4	4222		450- 900	400- 900		800	83	40.0	3300- 600		16000	VI	3.12-	2.65-
29	Cooper-Bessemer(1)GN		M,R,I	DI	8-10½x13½	W	4	9353		925- 750	750- 750		750	85	48.0	7400- 450		36000	VI	4.00-1.12	3.75-1
30	Cummins............A	Own	T,B,Tr,M,R,I	DI	4-4x5	W	4	251	67-2200■	56.5-2200■	33-1400■	18.00	750	74	35.3	180-1200	1355	1865	VI	1.37-	1.37-
31	Cummins............A	Own	T,B,Tr,M,R,I	DI	6-4x5	W	4	377	100-2200■	85-2200■	57-1600■	18.00	750	75	24.2	275-1200	1830	2030	VI	1.37-	1.37-
32	Cummins............H	Own	T,B,Tr,M,R,I	DI	4-4⅞x6	W	4	448	100-1800■	83-1800	60-1200■	17.00	750	74	32.8	340- 800	1930	3315	VI	1.75-	1.75-
33	Cummins............H	Own	T,B,Tr,M,R,I	DI	6-4⅞x6	W	4	672	150-1800■	125-1800	85-1400■	17.00	750	72	25.5	500- 800	2540	3670	VI	1.75-	1.75-
34	Cummins.........*HS	Own	T,B,Tr,M,R,I	DI	6-4⅞x6	W	4	672	200-1800■	175-1800	120-1400■	14.00	925	101	21.5	625-1400	3000	4040	VI	1.75-	1.75-
35	Fairbanks-Morse (4) 36	Own	M,R,I	TC	6-4¼x6	W	4	510		75-1200	60-1200	16.80	800	78		335 1050			VI		
36	Fairbanks-Morse (5) 36	Own	M,R,I	TC	6-5½x7½	W	4	1068		150-1200	120-1200	14.70	800	74		660-1050			VI		
37	Fairbanks-Morse (5) 46	Own	M,R,I	DI	6-8x10½	W	4	3167		324- 800	225- 720	14.90	800	78		2070- 650			VI		
38	General Motors...3-71	Own	T,B,Tr,M	DI	3-4¼x5		2	212		45-1200	62-2000	16.00	980	70	18.5♦	263-1000	1150		VI	No Valves	1.25-
39	General Motors...4-71	Own	T,B,Tr,M	DI	4-4¼x5		2	284		60-1200	83-2000	16.00	980	70	15.7♦	350-1000	1300		VI	No Valves	1.25-
40	General Motors...6-71	Own	T,B,Tr,M	DI	6-4¼x5		2	425		90-1200	123-2000	16.00	980	70	13.5♦	525-1000	1660		VI	No Valves	1.25-
41	Gray Marine........(7)	G.M.C.	M	DI	6-4¼x5		2	425		165-2000	123-1200	16.00	980	95	19.7	525-1000		2425	VI	No Valves	1.25-
42	Hercules........DIXC	Own	Tr,M,I	TC	2-4x4½	D	4	113	27.6-1800	23.5-1800	23.5-1800	15.50	750	91	25.9	81-1400	610	610	VI	1.62-	1.12-
43	Hercules........DIXD	Own	Tr,M,I	TC	2-4¼x4½	D	4	127	27.6-1600	23.5-1600	23.5-1600	15.50	750	92	25.9	91-1300	610	610	VI	1.62-	1.12-
44	Hercules.......DOOC	Own	T,Tr,M,I	TC	4-4x4½	D	4	226	70-2600	60-2600	47-1800	14.50	750	91	15.9♦	162-1400	750		VI	1.62-	1.12-
45	Hercules.......DOOD	Own	T,Tr,M,I	TC	4-4¼x4½	D	4	255	79-2600	66-2600	53-1800	14.50	750	91	14.2♦	180-1400	750		VI	1.62-	1.12-
46	Hercules........DJXC	Own	T,B,Tr,M,R,I	TC	6-3¾x4½	D	4	298	83-2600	71-2600	59-1800	14.50	750	87	14.8♦	208-1500	875		VI	1.62-	1.12-
47	Hercules.......DWXD	Own	T,B,Tr,M,R,I	TC	6-4¼x4¾	D	4	404	122-2400	104-2400	85-1800	14.50	750	93	14.4♦	299-1400	1220		VI	1.68-	1.25-
48	Hercules.......DRXB	Own	T,B,Tr,M,R,I	TC	6-4⅜x5¼	D	4	474	120-2000	102-2000	89-1600	14.50	750	94	16.1♦	350 1300	1435		VI	2.00-	1.37-
49	Hercules.......DRXC	Own	T,B,Tr,M,R,I	TC	6-4⅝x5¼	D	4	529	133-2000	113-2000	88-1400	14.50	750	94	16.3♦	380-1400	1435		VI	2.00-	1.37-
50	Hercules........DFXC	Own	T,B,M,R,I	TC	6-5¼x6	D	4	779	191-1800	162-1800	133-1400	14.50	750	97	18.0♦	585-1300	2400		VI	2.37-	1.62-
51	Hercules........DFXD	Own	T,B,M,R,I	TC	6-5½x6	D	4	855	193-1600	164-1600	147-1400	14.50	750	97	16.3♦	645-1350	2400		VI	2.37-	1.62-
52	Hercules........DFXE	Own	T,B,Tr,M,R,I	TC	6-5⅝x6	D	4	895	200-1600	171-1600	153-1400	14.50	750	97	15.7♦	685-1200	2400		VI	2.37-	1.62-
53	Hill...............2R	Own	M,I	PC	2-3½x5½	D	4	106		19.2-1450	16.4-1450	16.00		85	64	73-1100	1225		VI	1.31-	1.31-
54	Hill...............4R	Own	M,I	PC	4-3½x5½	D	4	212		48.5-1800	32.8-1450	16.00		85	44	151-1250	1615		VI	1.31-	1.31-
55	Hill...............6R	Own	M,I	PC	6-3½x5½	D	4	317		75.5-1800	49.3-1450	16.00		85	37.5	240-1100	2150		VI	1.31-	1.31-
56	International......UD6	Own	Tr,I	PC	4-3⅞x5¼	D	4	248	45-1500	38-1500	31.2-1500	14.20		66	40.2♦	156- 800	1253		VI	1.50-	1.31-
57	International......UD9	Own	Tr,I	PC	4-4.4x5½	D	4	334	63-1500	53-1500	42.4-1500	14.40		67	35.3♦	208- 800	1499		VI	1.65-	1.46-
58	International.....UD14	Own	Tr,I	PC	4-4¾x6½	W	4	461	82-1350	66-1350	54.8-1350	13.67		70	32.3♦	300- 800	1771		VI	1.78-	1.53-
59	International.....UD18	Own	Tr,I	PC	6-4¾x6½	W	4	691	119-1400	100-1400	80-1400	13.67		65	35.2♦	420- 800	2817		VI	1.78-	1.53-
60	Kermath..........DIX	Hercules	M	TC	2-4x4½	D	4	113		27-1800	20-1800	15.50	750	78	43.5	81-1400		870	VI	1.62-	1.12-
61	Kermath..........DOO	Hercules	M	TC	4-4x4½	D	4	226		65-2600	49-2600	14.50	500	66	24.5	162-1400		1200	VI	1.62-	1.12-
62	Kermath..........DJX	Hercules	M	TC	6-3¾x4½	D	4	298		84-2600	63-2600	14.50	500	64	21.5	208-1500		1355	VI	1.62-	1.12-
63	Kermath..........DRX	Hercules	M	TC	6-4⅜x5¼	D	4	474		113-1800	85-1800	14.50	475	79	24.7	350-1300		2100	VI	2.00-	1.37-
64	Kermath..........DHX	Hercules	M	TC	6-5x6	D	4	707		160-1600	120-1600	14.50	475	84	26.5	530-1400		3182	VI	2.37-	1.62-
65	Mack........END405	Lanova	T	LE	6-4x5⅜	D	4	405	107-2200	94-2200		14.60	840			308-1200	1710		VI	1.56-	1.50-
66	Mack........END457	Lanova	T,B	LE	6-4¼x5⅜	D	4	457				14.60	840			355-1100			VI	1.56-	1.56-
67	Mack........END605	Lanova	T,B	LE	6-4⅝x6	D	4	605	144-2000	130-2000		14.63	840			455-1100	1980		VI	1.64-	1.64-
68	Mack Mar.....457D-W	Lanova	M	LE	6-4¼x5⅜	D	4	457	110-1800		70-1500(8)	14.60	840	90	32.5	355-1100		2275(9)	VI	1.56-	1.56-
69	Mack Mar.....457D-Y	Lanova	M	LE	6-4¼x5⅜	D	4	457	115-1950			14.60	840			355-1100		2250**	VI	1.56-	1.56-
70	Mack Mar.....605D-W	Lanova	M	LE	6-4⅝x6	D	4	605	125-1800		100-1500(8)	14.63	840	90	32.0	410-1000		3200(9)	VI	1.64-	1.64-
71	Mack Mar.....605D-Y	Lanova	M	LE	6-4⅝x6	D	4	605	140-1800	133-1800		14.63	840			455-1100		2775	VI	1.64-	1.64-
72	Murphy.........ME-4	Own	M,I,GS	DI	4-5¾x6½	W	4	675		105-1200	90-1200	17.00		88	47.0	472- 900	4300	6350	VI	1.62d-	1.62d-
73	Murphy.........ME-6	Own	M,I,GS	DI	6-5¾x6½	W	4	1013		160-1200	135-1200	17.00		88.5	38.5	732- 850	5200	7940	VI	1.62d-	1.62d-
74	Murphy......*ME-650	Own	M,I,GS	DI	6-5¾x6½	W	4	1013		200-1200	165-1200	17.00		107	37.0	960- 775	5900	8190	VI	1.62d-	1.62d-
75	Murphy.........ME-66	Own	M,I,GS	DI	6-6x6½	W	4	1103		180-1200	150-1200	17.00		90	34.5	8.30-800	5200	7940	VI	1.62d-	1.62d-
76	Murphy.........ME-46	Own	M,I,GS	DI	4-6x6½	W	4	735		115-1200	100-1200	17.00		90	43.0	5.53-800	4300	6350	VI	1.62d-	1.62d-

(For abbreviations see pages 124 and 125)

EL AND OTHER HEAVY OIL ENGINES

ALVES	VALVES	PISTONS					PISTON PIN		CONNECTING RODS			MAIN BEARINGS		INJECTION SYSTEM									START-ING METHOD		OVER ALL DIMENSIONS			
Intake Port Diameter and Lift (In.)	Exhaust Port Diameter and Lift (In.)	Material	Length (In.)	Weight with Rings and Pin (Lb.)	No. of Compression Rings	No. of Oil Rings	Diameter and Length (In.)	Locked in—	Material (S.A.E. No.)	Center to Center Length (In.)	Weight with Cap and Bushing (Lb.)	Number	Diameter (In.)	Make of Pump	Make of Valve	Valve Type—Open or Closed	Orifices	Pressure—Nozzle Opening (Lb. per Sq. In.)	Air Cleaner—Make	Fuel Filter—Make	Lubricant Filter—Make	Minimum Recommended Cetane, Number of Fuel	Make	Type	Length—Fan to Flywheel (In.)	Width (In.)	Height—To Top of Air Cleaner (In.)	ne Number
.06- .39	.96- .390	Alu	4.25	1.20	3	2	.937-2.75	F	X1335	7.56	2.50	2	2.25	AB	AB	C	Pi	1600	Op	AB	Op	45	Op	E-H	20 5/16	20½	36 11/16	1
.06- .39	.96- .390	Alu	4.25	1.20	3	2	.937-2.75	F	X1335	7.56	2.50	4	2.25	AB	AB	C	Pi	1600	Op	AB	Op	45	Op	E-H	31½	23⅝	34 7/16	2
.37- .48	1.18- .486	Alu	4.93	3.00	3	2	1.25-2.92	F	1035	9.50	3.41	5	3.00	AB	AB	C	Pi	2000	Uni	B-P	DeL	46	DR	Ele	33 27/32	25¾	36¼ (12)	3
.37- .48	1.18- .486	Alu	4.93	3.00	3	2	1.25-2.92	F	1035	9.50	3.41	5	3.00	AB	AB	C	Pi	2000	...	B-P	DeL	46	DR	Ele	46⅞ (11)	26⅞	33⅜ (12)	4
.37- .48	1.18- .486	Alu	4.93	3.36	3	2	1.25-3.06	F	1035	9.50	3.41	5	3.00	AB	AB	C	Pi	2000	Uni	B-P	DeL	46	DR	Ele	33 27/32	25¾	36¼ (12)	5
.37- .48	1.18- .486	Alu	5.06	3.00	3	2	1.25-2.92	F	1035	9.50	3.41	7	3.00	AB	AB	C	Pi	2000	Uni	B-P	DeL	46	DR	Ele	42 15/32	27	35 13/32 (12)	6
.37- .48	1.18- .486	Alu	4.93	3.00	3	2	1.25-2.92	F	1035	9.50	3.41	7	3.00	AB	AB	C	Pi	2000	Uni	B-P	DeL	46	DR	Ele	42 15/32	27	35 13/32 (12)	7
.37- .48	1.18- .486	Alu	4.93	3.00	3	2	1.25-2.92	F	1035	9.50	3.41	7	3.00	AB	AB	C	Pi	2000	Uni	B-P	DeL	46	DR	Ele	42 15/32	27	35 13/32 (12)	8
.37- .48	1.18- .486	Alu	4.93	3.00	3	2	1.25-2.92	F	1035	9.50	3.41	7	3.00	AB	AB	C	Pi	2000	...	B-P	DeL	46	DR	Ele	54 3/16 (11)	27 11/32	34 9/16 (12)	9
.44- .47	1.31- .476	Alu	5.25	3.84	3	2	1.50-3.18	F	6140	11.00	4.87	7	3.00	AB	AB	C	Pi	2000	Uni	B-P	DeL	46	DR	Ele	48½	25¾	37 3/16 (12)	10
.59- .47	1.37- .476	Alu	5.25	4.48	3	2	1.50-3.56	F	6140	11.00	4.87	7	3.00	AB	AB	C	Pi	2000	Uni	B-P	DeL	46	DR	Ele	48½	25¾	37 3/16 (12)	11
.59- .47	1.37- .476	Alu	5.25	4.48	3	2	1.50-3.56	F	6140	11.00	4.87	7	3.00	AB	AB	C	Pi	2000	...	B-P	DeL	46	DR	Ele	61 17/32 (11)	29⅞	36⅞ (12)	12
.72- .51	1.56- .516	Alu	6.00	5.43	3	2	1.75-3.90	F	6140	12.50	10.25	7	3.50	AB	AB	C	Pi	2000	Uni	P-S	DeL	46	DR	Ele	57¾	34 5/16	44 15/16 (12)	13
.72- .51	1.56- .516	Alu	6.00	5.43	3	2	1.75-3.90	F	6140	12.50	10.25	7	3.50	AB	AB	C	Pi	2000	...	P-S	DeL	46	DR	Ele	76 1/16 (11)	32	43½ (12)	14
.90- .54	1.78- .540	Alu	8.00	9.30	3	2	2.00-4.37	F	6140	14.25	13.10	7	3.50	AB	AB	C	Pi	2000	Uni	P-S	DeL	46	D-N	E-G	68¾	34½	58 11/32 (12)	15
.90- .54	1.78- .540	Alu	8.00	9.30	3	2	2.00-4.37	F	6140	14.25	13.10	7	3.50	AB	AB	C	Pi	2000	...	P-S	DeL	46	D-N	E-G	88 1/16 (11)	32 13/16	47¾ (12)	16
2.25- .68	2.02- .687	Alu	9.31	17.50	3	2	2.75-5.03	F	1035	17.75	28.51	7	3.75	AB	AB	C	Pi	1800	Uni	P-S	DeL	46	D-N	E-G	86 11/16	38 11/32	62 3/16 (12)	17
2.37- .68	2.12- .687	Alu	9.31	17.50	3	2	2.75-5.28	F	1035	17.75	28.51	7	3.75	AB	AB	C	Pi	1800	Uni	P-S	DeL	46	D-N	E-G	86 11/16	38 11/32	62 3/16 (12)	18
2.50- .68	2.16- .687	Alu	9.31	19.19	3	2	2.75-5.53	F	1035	17.75	28.51	7	3.75	AB	AB	C	Pi	1800	Uni	P-S	DeL	46	D-N	E-G	86 11/16	38 11/32	62 3/16 (12)	19
2.50- .68	2.16- .687	Alu	9.31	19.19	3	2	2.75-5.53	F	1035	17.75	28.51	7	3.75	AB	AB	C	Pi	1800	...	P-S	DeL	46	D-N	E-G	114⅞ (11)	37 3/16	62 7/16 (12)	20
2.50- .68	2.16- .687	Alu	9.31	19.19	3	2	2.75-5.53	F	1035	17.75	28.51	7	3.75	AB	AB	C	Pi	1800	Uni	P-S	DeL	46	D-N	E-G	95⅜	48	82 5/16 (12)	21
...	...	Alu	9.18	...	4	2	2.37-4.75	F	...	16.00	...	5	4.00	Own	Own	C	Si	1750	Don	Own	Own	35	Own	G	88	49½	60⅜	22
...	...	Alu	9.18	...	4	2	2.37-4.75	F	...	15.00	...	7	3.75	Own	Own	C	Si	1750	Don	Own	Own	35	Own	G	100½	42¾	66 11/16	23
...	...	Alu	9.18	...	4	2	2.37-4.75	F	...	15.00	...	5	3.75	Own	Own	C	Si	1750	Don	Own	Own	35	Own	G	70 5/16	46⅝	66	24
...	...	Alu	6.18	...	3	2	1.75-3.50	F	...	10.25	...	7	3.00	Own	Own	C	Si	1500	Don	Own	Own	35	Own	G	67 7/16	29⅞	55⅞	25
...	...	Alu	6.18	...	3	2	1.75-3.50	F	...	10.25	...	5	3.00	Own	Own	C	Si	1500	Don	Own	Own	35	Own	G	54	29⅞	50 13/16	26
...	...	Alu	5.56	...	3	2	1.56-3.00	F	...	10.25	...	5	2.75	Own	Own	C	Si	1500	Don	Own	Own	35	Own	G	51	25	47 9/16	27
3.12- .75	2.65- .757	Alu	14.00	28.75	4	2	3.25-7.00	R	3140	21.00	54.0†	9	6.00	Own	AB	C	Mu	2500	Op	Pur	Cun	...	Own	Air	128½	30½	66	28
4.00-1.12	3.75-1.125	Alu	17.17	58.00	5	2	4.00-9.37	R	1040	27.00	135.7†	9	7.50	Own	AB	C	Mu	2500	Op	Pur	Cun	...	Own	Air	158½	42¼	83	29
1.37- .40	1.37- .406	Cl	5.04	5.70	3	2	1.49-3.37	F	E-4135	9.50	6.6	5	3.87	Own	Own	...	Mu	...	Don	Cun	Nug	50	L-D	Ele	35⅞ (2)	27 7/16	39 1/16 (3)	30
1.37- .40	1.37- .406	Cl	5.04	5.70	3	2	1.49-3.37	F	E-4135	9.50	6.6	7	3.87	Own	Own	...	Mu	...	Don	Cun	Nug	50	L-D	Ele	46⅜ (2)	28⅜	39 1/16 (3)	31
1.75 .50	1.75- .500	Cl	6.25	10.56	3	2	1.99-4.09	F	E-4135	12.00	10.2	5	4.50	Own	Own	...	Mu	...	Don	Cun	Nug	50	L-D	Ele	43 7/32 (2)	29⅝	47 11/32 (3)	32
1.75 .50	1.75- .500	Cl	6.25	10.56	3	2	1.99-4.09	F	E-4135	12.00	10.2	7	4.50	Own	Own	...	Mu	...	Don	Cun	Nug	50	L-D	Ele	57 3/32 (2)	29⅝	47 11/32 (3)	33
1.75 .50	1.75- .500	Alu	6.25	7.2	3	2	1.99-4.09	F	E-4135	12.00	10.2	7	4.50	Own	Own	...	Mu	...	Don	Cun	Nug	50	L-D	Ele	60 15/32 (2)	30 5/16	47 11/32 (3)	34
...	...	Cl (a	...	...	...	...	...	...	...	...	...	7	3.00	AB	AB	C	Pi	1700	Op	...	...	50	...	(6)(k)	65	25¾	32⅞††	35
...	...	Cl	...	...	...	...	...	...	...	...	...	8	5.50	AB	AB	C	Pi	1500	Op	...	...	50	...	(6)	79⅜	29⅝	39¾††	36
...	...	Cl	...	...	...	...	...	...	...	...	...	7	5.50	Own	Own	C	Mu	3000	Op	...	...	45	...	Air	117	44¾	51††	37
No Valve	1.25- .375	AT	6.00	7.00	4	2	1.50-3.62	F	1340	10.12	6.14	4	3.50	Own	Own	C	Mu	...	AC	AC	AC	45	DR	Ele	36	30⅝	38	38
No Valve	1.25- .375	AT	6.00	7.00	4	2	1.50-3.62	F	1340	10.12	6.14	5	3.50	Own	Own	C	Mu	...	AC	AC	AC	45	DR	Ele	42	30⅝	38	39
No Valve	1.25- .375	AT	6.00	7.00	4	2	1.50-3.62	F	1340	10.12	6.14	7	3.50	Own	Own	C	Mu	...	AC	AC	AC	45	DR	Ele	54	30⅝	38	40
No Valve	1.25- .375	AT	6.00	7.00	4	2	1.50-3.62	F	T-1340	10.12	6.12	7	3.50	GM	GM	C	Mu	...	AC	AC	AC	40	DR	Ele	73⅜	30⅝	37½	41
1.62- .3	1.12- .375	Alu	4.84	4.00	4	2	1.18-3.45	F	CNM	8.00	5.31	2	3.00	AB	AB	C	Pi	1450	...	...	...	45	DR	E-H	27 11/16 (2)	16⅝	36¼	42
1.62- .3	1.12- .375	Alu	4.84	4.47	4	2	1.18-3.70	F	CNM	8.00	5.31	2	3.00	AB	AB	C	Pi	1450	...	...	...	45	DR	E-H	27 11/16 (2)	16⅝	36¼	43
1.62- .3	1.12- .375	Alu	4.84	4.00	4	2	1.18-3.45	F	CNM	8.00	5.31	5	3.00	AB	AB	C	Pi	1650	...	...	...	45	L-D	E-G	32 1/16 (2)	22⅞	36	44
1.62- .3	1.12- .375	Alu	4.84	4.47	4	2	1.18-3.70	F	CNM	8.00	5.31	5	3.00	AB	AB	C	Pi	1650	...	...	...	45	L-D	E-G	32 1/16 (2)	22⅞	36	45
1.62- .3	1.12- .375	Alu	4.84	3.56	4	2	1.18-3.20	F	CNM	8.00	5.31	7	3.00	AB	AB	C	Pi	1650	...	...	...	45	L-D	E-G	39 (2)	22 5/16	32¼	46
1.68- .3	1.25- .395	Alu	4.84	4.47	4	2	1.18-3.70	F	CNM	8.50	...	7	3.50	AB	AB	C	Pi	1650	...	...	...	45	L-D	Ele	46 11/32 (2)	25¾	36½	47
2.00- .3	1.37- .395	Alu	6.84	7.09	4	2	1.62-3.75	F	CNM	9.37	8.59	7	3.50	AB	AB	C	Pi	1650	...	...	...	45	L-D	E-G	46 5/16 (2)	27	38¾	48
2.00- .3	1.37- .395	Alu	6.84	7.93	4	2	1.62-3.93	F	CNM	9.37	8.59	7	3.50	AB	AB	C	Pi	1650	...	...	...	45	L-D	E-G	46 5/16 (2)	27	38⅜	49
2.37- .5	1.62- .500	Alu	7.53	11.69	4	2	2.00-4.42	F	CNM	12.00	13.75	7	4.50	AB	AB	C	Pi	2000	...	...	...	45	L-D	Ele	62 27/32 (2)	30⅝	46 5/16	50
2.37- .5	1.62- .500	Alu	7.53	12.37	4	2	2.00-4.65	F	CNM	12.00	13.75	7	4.50	AB	AB	C	Pi	2000	...	...	...	45	L-D	Ele	62 27/32 (2)	30⅝	46 5/16	51
2.37- .5	1.62- .500	Alu	7.53	12.34	4	2	2.00-4.65	F	CNM	12.00	13.75	7	4.50	AB	AB	C	Pi	2000	...	...	...	45	L-D	Ele	62 27/32 (2)	30⅝	46 5/16	52
1.31- .3	1.31- .372	Alu	4.78	2.83	3	2	1.50-2.72	F	4130	13.25	7.16	3	3.13	AB	AB	C	Pi	1800	Uni	Fram	Cun	...	AL	E-H	30	25	40	53
1.31- .3	1.31- .372	Alu	4.78	2.83	3	2	1.50-2.72	F	4130	13.25	7.16	5	3.13	AB	AB	C	Pi	1800	Uni	Fram	Cun	...	AL	Ele	40	25	40	54
1.31- .3	1.31- .372	Alu	4.78	2.83	3	2	1.50-2.72	F	4130	13.25	7.16	7	3.13	AB	AB	C	Pi	1800	AM	Fram	Cun	...	AL	Ele	50	25	40	55
1.50- .5	1.31- .500	Alu	5.70	4.33	3	2	1.31-3.25	F	1040	10.00	8.01	5	3.75	Own	Own	C	Si	700	Don	Pur	Pur	...	Own	Ha	38½	21¾	39 3/16	56
1.65- .5	1.46- .500	Alu	6.43	6.22	3	2	1.50-3.70	F	1040	11.00	10.83	5	4.12	Own	Own	C	Si	700	Don	Pur	Pur	...	Own	Ha	41½	23 13/16	42½	57
1.78- .5	1.53- .503	Alu	6.19	7.27	4	2	1.62-4.10	F	1040	13.25	11.91	5	3.25	Own	Own	C	Si	700	Don	Pur	Pur	...	Own	Ha	47 1/16	27⅜	45 13/16	58
1.78- .5	1.53- .503	Alu	6.19	7.27	4	2	1.62-4.10	F	1040	13.25	11.91	7	3.50	Own	Own	C	Si	700	Don	Pur	Pur	...	Own	Ha	60 11/16	29¼	47 5/16	59
1.62- .3	1.12- .375	Alu	4.84	4.00	5	1	...	...	CNM	8.00	5.31	2	...	AB	AB	C	Pi	1650	AC	Pur	DeL	...	DR	Ele	41 9/16	23	30⅜	60
1.62- .3	1.12- .375	Alu	4.84	4.00	5	1	...	...	CNM	8.00	5.31	...	...	AB	AB	C	Pi	1650	AC	Pur	Pur	...	DR	Ele	47¾	22½	33	61
1.62- .3	1.12- .375	Alu	4.84	3.56	5	1	...	...	CNM	8.00	5.31	...	...	AB	AB	C	Pi	1650	AC	Pur	Pur	...	DR	Ele	54 11/16	22½	33	62
2.00- .3	1.37- .395	Alu	6.84	7.09	5	1	...	...	CNM	9.37	8.59	...	...	AB	AB	C	Pi	1650	AM	Pur	Pur	...	DR	Ele	60 1/16	27⅝	37 13/16	63
2.37- .5	1.62- .500	Alu	7.53	9.94	5	1	...	...	CNM	12.00	13.00	...	...	AB	AB	C	Pi	1650	AM	Pur	Pur	...	DR	Ele	76⅝	31	45	64
1.56- .4	1.50- .418	Alu	5.29	4.57	3	2	1.43-3.60	F	4130	10.50	4.87	7	3.50	AB	Exc	C	Pi	1400	Vor	Pur	DeL	46	LN	Ele	27⅞	46	50 15/16	65
1.56- .4	1.56- .418	Alu	5.29	...	3	2	1.43-3.81	F	4130	10.50	...	7	3.50	AB	AB	C	Pi	1400	Vor	Pur	DeL	46	LN	Ele	27⅞	46	50 15/16	66
1.64- .5	1.64- .500	Alu	5.62	6.30	3	2	1.62-4.17	F	4130	11.25	7.13	7	3.50	AB	AB	C	Pi	1700	Vor	Pur	Own	46	LN	Ele	53 3/32	31⅞	53 3/32	67
1.56- .4	1.56- .418	Alu	5.29	...	3	2	1.43-3.81	F	4130	10.50	...	7	3.50	AB	AB	C	Pi	1400	WGB	Pur	WGB	46	LN	Ele	71⅜ (16)	27	39½	68
1.56- .4	1.56- .418	Alu	5.29	...	3	2	1.43-3.81	F	4130	10.50	...	7	3.50	AB	AB	C	Pi	1400	WGB	Pur	WGB	46	LN	Ele	71⅜ (16)	27	39½	69
1.64- .5	1.64- .500	Alu	5.62	6.30	3	2	1.62-4.17	F	4130	11.25	7.13	7	3.50	AB	AB	C	Pi	1700	WGB	Pur	WGB	46	LN	Ele	80⅜ (16)	29	41 3/16	70
1.64- .5	1.64- .500	Alu	5.62	6.30	3	2	1.62-4.17	F	4130	11.25	7.13	7	3.50	AB	AB	C	Pi	1700	WGB	Pur	WGB	46	LN	Ele	80⅜ (16)	29	41 3/16	71
1.62d- .5	1.62d- .500	Gl	7.75	19.43	4	2	2.12-4.73	F	1035	12.50	14.7	5	4.00	Own	Own	C	Mu	1500	Don	OP	Pur	50	DR	Ele	56 7/16	37	60 13/16	72
1.62d- .5	1.62d- .500	Gl	7.75	19.43	4	2	2.12-4.73	F	1035	12.50	14.7	7	4.00	Own	Own	C	Mu	1500	Don	OP	Pur	50	DR	Ele	73 7/16	37	53¾	73
1.62d- .5	1.62d- .500	Gl	7.75	20.5	4	2	2.12-4.73	F	1035	12.50	14.7	7	4.00	Own	Own	C	Mu	1500	Don	OP	Pur	50	DR	Ele	76 3/16	37	51 13/16	74
1.62d- .5	1.62d- .500	Gl	7.75	20.9	4	2	2.12-4.98	F	1035	12.50	14.7	7	4.00	Own	Own	C	Mu	1500	Don	OP	Pur	50	DR	Ele	76 7/16	37	57⅛	75
1.62d- .5	1.62d- .500	Gl	7.75	20.9	4	2	2.12-4.98	F	1035	12.50	14.7	5	4.00	Own	Own	C	Mu	1500	Don	OP	Pur	50	DR	Ele	56 7/16	37	60 13/16	76

(For abbreviations see pages 124 and 125)

Automotive Diesel and

Line Number	ENGINE MAKE AND MODEL	Built Under License from	GENERAL: Designed for	Type	Number of Cylinders Bore and Stroke (In.)	Cylinder Liners —Type	Cycle	Piston Displacement (Cu. In.)	With Bare Engine: Maximum Brake Hp. at Specified R.P.M.	With Standard Accessories: Max. Intermittant Hp. at Specified R.P.M.	With Standard Accessories: Continuous Sustained Hp. at Specified R.P.M.	Compression Ratio - to 1	Max. Combustion Pressure (Lb. per Sq. In.)	B.M.E.P. at Continuous Hp. (Lb. per Sq. In.)	Weight per Continuous Hp. (Lb.)	Max. Torque in Lb. Ft. at Specified R.P.M.	Shipping Weight (Lb.): Automotive or Industrial	Shipping Weight (Lb.): Marine	VALVES: Arrangement	Intake Port Diameter and Lift (In.)
1	Red Wing....42-54HP	Wau-Hes	M	DI	4-4x5	W	4	251	55-2200	42-2000	31-1500	5.90	500	65	......	155-1000	....	....	VI	1.62- .445
2	Red Wing....55-60HP	Wau-Hes	M	DI	4-4⅝x5¼	W	4	353	62-1600	59-1600	55-1400	5.60	500	88	21.8	230- 800	....	1200	VI	1.75- .455
3	Red Wing....65-75HP	Wau-Hes	M	DI	6-3¾x4¼	W	4	282	78-2800	75-2800	59-1800	6.40	500	92	16.1	174-1400	....	950	VI	1.62- .371
4	Red Wing..100-125HP	Wau-Hes	M	DI	6-4½x5½	W	4	525	128-2100	125-2100	106-1500	5.80	500	107	17.0	370-1500	....	1800	VI	1.87- .530
5	Red Wing..160-180HP	Wau Hes	M	DI	6-6½x7	W	4	1395	174-1125	170-1125	165-1050	5.40	500	89	33.9	900-500	....	5600	VI	2.50- .710
6	Red Wing..180-200HP	Wau-Hes	M	DI	6-7x7	W	4	1616	200-1125	196-1125	188-1050	5.30	500	87	30.8	1030-500	....	5800	VI	2.50- .710
7	Reo..........6DT-294	Buda-Lan	T	AC	6-3⅝x4¾	D	4	294	75-2400	....	....	14.50	725	76	......	212-1400	....	....	VI	....
8	Reo..........6DT-317	Buda-Lan	T	AC	6-3⅝x5⅛	D	4	317	78-2300	....	....	14.50	725	73	......	195-1400	....	....	VI	....
9	Reo..........6DT-468	Buda-Lan	T	AC	6-4¼x5½	D	4	468	113-2000	89-2000	68-1600	14.20	725	72	21.1	268-1100	1435	....	VI	1.59- .470
10	Scripps 7000A,1A,2A,3A	Hercules	M	TC	4-4¼x4½	D	4	255	79-2600	68-2600	52-1800	14.50	750	90	23.1	185-1400	....	1200	VI	1.62- .375
11	Scripps 8500A,1A,2A,3A	Hercules	M	TC	6-4x4½	D	4	339	103-2600	88-2600	68-1800	14.50	750	88	21.1	238-1500	....	1435	VI	1.62- .375
12	Superior..........A-4	Own	M,I	TC	4-4½x5¾	W	4	366	....	62.5-1500	42-1200	11.80	675	76	44.6	268-1200	....	1875	VI	1.87- .432
13	Superior..........A-6	Own	M,I	TC	6-4½x5¾	W	4	549	....	110-1800	62.5-1200	11.80	675	75	38.4	400-1200	....	2400	VI	1.87- .432
14	Superior..........D-4	Own	M,I	TC	4-5½x7	W	4	665	....	90-1200	76-1200	11.80	750	75	36.0	328-1200	....	3500	VI	2.25- .652
15	Superior..........D-6	Own	M,I	TC	6-5½x7	W	4	998	....	170-1500	114-1200	11.80	750	76	27.3	727-1000	....	4250	VI	2.25- .652
16	Superior..........D-8	Own	M,I	TC	8-5½x7	W	4	1330	....	230-1500	152-1200	11.80	750	75	34.9	985-1000	....	5300	VI	2.25- .652
17	Superior........P.T.D.	Own	M,I	DI	6-8½x10½	W	4	3575	....	300- 900	240- 720	12.50	750	74	54.2	1750- 900	....	13000	VI	3.12- .875
18	Superior........P.T.D.	Own	M,I	DI	8-8½x10½	W	4	4767	....	400- 900	320- 720	12.50	750	74	50.0	2000- 900	....	16000	VI	3.12- .875
19	Waukesha..(14) 130HS	Hes	T,Tr,I	DI	4-3¾x5	W	4	221	48-2200	38-2200	28-1500	6.12	500	67	24.8♦	142-1000	695	....	VI	1.62- .445
20	Waukesha..(14) 130HL	Hes	T,Tr,I	DI	4-4x5	W	4	251	55-2200	44-2200	31-1500	5.90	500	65	22.7	155-1000	705	....	VI	1.62- .445
21	Waukesha..(14) VRZH	Hes	T,Tr,I	DI	4-4⅝x5¼	W	4	353	59-1600	47-1600	41-1400	5.60	500	65	25.6♦	229-700	1050	....	VI	1.75- .450
22	Waukesha..(13) 6BKH	Hes	T,B,I	DI	6-3¾x4¼	N	4	282	83-2800	67-2800	44-1800	6.40	500	69	22.1♦	174-1400	975	....	VI	1.62- .375
23	Waukesha..(13) 140HS	Hes	T,B,I	DI	6-4¼x5½	W	4	468	114-2250	95-2250	67-1500	5.80	500	75	22.5♦	342-1000	1510	....	VI	1.87- .531
24	Waukesha..(13) 140HK	Hes	T,B,I	DI	6-4½x5½	W	4	525	128-2250	109-2250	75-1500	5.80	500	74	21.0♦	383-1000	1550	....	VI	1.87- .531
25	Waukesha..(13) 145HS	Hes	T,B,I	DI	6-4¾x6	W	4	638	143-2000	121-2000	86-1400	5.60	500	76	21.3♦	450-900	1835	....	VI	1.87- .594
26	Waukesha (13) 145HK	Hes	T,B,M,I	DI	6-5¼x6	W	4	779	174-2000	148-2000	106-1400	5.60	500	77	17.6♦	550-900	1865	2900	VI	1.87- .594
27	Waukesha (14) 6WALH	Hes	T,B,M,I	DI	6-5¾x6½	W	4	1013	172-1800	135-1600	117-1300	5.25	500	70	26.9♦	686-700	3150	3885	VI	2.37- .656
28	Waukesha (14) 6WAKH	Hes	T,B,M,R,I	DI	6-6¼x6½	W	4	1197	202-1800	162-1600	139-1300	5.20	500	71	23.0♦	811-700	3200	3935	VI	2.37- .656
29	Waukesha...(14) 6ELH	Hes	I	DI	6-6½x7	W	4	1395	171-1125	131-1125	124-1050	5.60	500	67	48.0♦	900-500	5975	....	VI	2.50- .713
30	Waukesha..(14) 6EKH	Hes	I	DI	6-7x7	W	4	1616	196-1125	154-1125	142-1050	5.50	500	67	42.2♦	1030-500	6000	....	VI	2.50- .713
31	Waukesha..(14) 6NKH	Hes	M,I	DI	6-7x8½	W	4	1962	226-1050	187-1050	160-950	5.42	500	68	38.8♦	1350-650	6200	7280	VI	2.50- .713
32	Waukesha..(14) 6LRH	Hes	M,R,I	DI	6-8½x8½	W	4	2894	333-1050	277-1050	225-900	5.43	500	68	47.8♦	1830-550	10750	9350	VI	3.25- .750
33	Witte..............AD	....	I	PC	1-3¼x4½	W	4	37.3	5.2-1500	4.5-1200	4-1200	19.00	800	71	150.0♦	19-1200	600	....	VI	1.31- .298
34	Witte..............LD	....	I	PC	1-4¼x5¼	W	4	74.4	14-1500	11-1200	9-1200	17.00	750	80	101.0♦	48-1200	910	....	VI	1.75- .422
35	Witte..............MD	....	I	PC	1-5x8	W	4	157	15.6- 800	14—720	12-720	16.00	800	84	116.7♦	103-720	1400	....	HI	1.87- .415
36	Witte..............KD	....	I	PC	1-4¼x6	W	4	85	7.9- 900	7.5-850	6-850	16.00	800	66	166.7♦	46-850	1000	....	HI	1.58- .318

ABBREVIATIONS

■—Without fan or muffler
♦—Based on automotive or industrial weight, all others on marine.
‡—With full equipment but without radiator fan
*—Supercharged
**—Direct drive
†—Includes piston pin
††—From center line of crankshaft to top of engine.
(1)—Also built in 6 cylinder models
(2)—Fan to flywheel housing
(3)—To top of water outlet (highest point)
(4)—Also built in 1, 2, 3, 4 and 8 cylinder models
(5)—Also built in 8 cylinder model
(6)—Air, electric
(7)—Also built in 1, 2, 3 and 4 cylinder models
(8)—Rating for marine work boats
(9)—With reduction gear
(10)—Cast iron to 1600 R.P.M., aluminum above 1600 R.P.M.
(11)—Includes radiator
(12)—From bottom of pan to air cleaner mounting flange
(13)—Automotive power ratings
(14)—Industrial power ratings
(16)—Overall engine length
A—Air
(a)—Aluminum on 1, 2 and 3 cyl.
AB—American Bosch
AC—Air chamber
AC—AC Spark Plug Co.
Al—Alloy iron
AL—Electric Auto-Lite Co.
Alu—Aluminum
AM—Air-Maze Corp.
AT—Arma Steel, tin plated
B—Buses
B-P—Bosh or Purolator
Bur—Burgess
C—Cars
C—Closed
Cl—Cast Iron
CNM—Chrome-nickel molybdenum
Cun—Cuno Engineering Corp.
d—Dual
D—Dry liners used
DeL—DeLuxe Products Corp.

ALPHABETICAL LIST OF

AAA—Agricultural Adjustment Administration
AMA—Agricultural Marketing Administration
ARA—Agricultural Research Administration
BAE—Bureau of Agricultural Economics
BEO—Board of Economic Operations
BEW—Board of Economic Warfare
BIR—Bureau of Internal Revenue
BLS—Bureau of Labor Statistics
BPA—Bonneville Power Admin.
BTA—Board of Tax Appeals
BWC—Board of War Communications
BWRL—Bureau of War Risk Litigation
CAA—Civil Aeronautics Admin.
CAB—Civil Aeronautics Board
CCC—Civilian Conservation Corps
CCC—Commodity Credit Corp.
CFB—Combined Food Board (U. S.-British)
CIAA—Office of the Co-ordinator of Inter-American Affairs
CPRB—Combined Production and Resources Board (U. S.-British)
CRI—Committee for Reciprocity Information
CRMB—Combined Raw Materials Board (U. S.-British)
CSAB—Combined Shipping Adjustment Board (U. S.-British)
CSC—Civil Service Commission
DHC—Defense Homes Corp.
DHWS—Office of Defense Health and Welfare Services
DLC—Disaster Loan Corp.
DMR—Division of Monetary Research
DPC—Defense Plant Corp.
DSC—Defense Supplies Corp.
DTR—Division of Tax Research
FBI—Federal Bureau of Investigation
FCA—Farm Credit Administration
FCC—Feder Communications Commission
FDIC—Federal Deposit Insurance Corp.
FHA—Federal Housing Administration
FLA—Federal Loan Agency
FPC—Federal Power Commission
FPHA—Federal Public Housing Authority
FRS—Federal Reserve System
FSA—Farm Security Administration
FSA—Federal Security Agency
FTC—Federal Trade Commission
FWA—Federal Works Agency
GAO—General Accounting Office
GPO—Government Printing Office
HOLC—Home Owners' Loan Corp.

Other Heavy Oil Engines—*Concluded*

VALVES	PISTONS					PISTON PINS		CONNECTING RODS			MAIN BEARINGS		INJECTION SYSTEM									STARTING METHOD		OVER ALL DIMENSIONS			
Exhaust Port Diameter and Lift (In.)	Material	Length (In.)	Weight with Rings and Pin (Lb.)	No. of Compression Rings	No. of Oil Rings	Diameter and Length (In.)	Locked In—	Material (S.A.E. No.)	Center to Center Length (In.)	Weight with Cap and Bushing (Lb.)	Number	Diameter (In.)	Make of Pump	Make of Valve	Valve Type—Open or Closed	Orifices	Pressure—Nozzle Opening (Lb. per Sq. In.)	Air Cleaner—Make	Fuel Filter—Make	Lubricant Filter—Make	Minimum Recommended Cetane Number of Fuel	Make	Type	Length—Fan to Flywheel (In.)	Width (In.)	Height—To Top of Air Cleaner (In.)	Line Number
1.25- .453	CI	5.12	4.30	3	1	1.12-3.06	F	1045	8.75	3.56	3	2.62	AB	Hes	O	Mu	1200	.....	Mic	Mic	...	DR	Ele	48 5/16	24	33 9/16	1
1.50- .450	CI	5.96	6.00	3	1	1.31-....	F	1045	10.50	5.30	3	2.37	AB	Vik	O	Mu	1200	.....	Mic	Mic	60	AL	Ele	52 13/16	21 1/4	38 1/8	2
1.25- .375	Alu	4.87	2.56	3	1	1.00-3.50	F	1045	8.00	3.50	7	2.62	AB	Vik	O	Mu	1200	.....	Mic	Mic	60	DR	Ele	53 13/16	23 1/8	31 1/8	3
1.37 -.469	Alu	6.50	4.00	3	1	1.37-3.87	F	1045	10.25	5.31	7	3.25	AB	Vik	O	Mu	1200	.....	Mic	Mic	60	DR	Ele	78 3/8	29	41 5/16	4
2.25- .710	CI	9.25	20.50	3	1	2.00-5.50	F	1045	15.37	19.60	7	3.75	AB	Vik	O	Mu	1200	Vor	Mic	DeL	60	DR	Ele	100 11/16	30 1/2	56 13/16	5
2.25- .710	CI	9.25	24.75	3	1	2.00-6.00	F	1045	15.37	19.60	7	3.75	AB	Vik	O	Mu	1200	Vor	Mic	DeL	60	DR	Ele	100 11/16	30 1/2	56 13/16	6
....	Alu	4.93	.....	4	1	1.25-2.75	...	1035	9.50	3.41	7	3.00	.....	.....	C	Pi	2000	.....	.....	.....	46	.....	.....	42 3/16	25 1/2	36 5/16	7
....	Alu	4.93	.....	4	1	1.25-2.90	...	1035	9.50	3.41	7	3.00	.....	.....	C	Pi	2000	.....	.....	.....	46	.....	.....	42 3/16	25 1/2	36 3/16	8
1.37- .476	Alu	5.25	4.48	3	2	1.50-3.56	F	6140	11.00	4.87	7	3.00	AB	AB	C	Pi	2000	Uni	B-P	DeL	46	DR	Ele	48 1/2	25 3/4	37 5/16 (12)	9
1.12- .375	Alu	4.84	4.00	4	2	1.18-3.45	F	CNM	8.00	5.31	5	3.00	AB	AB	C	Pi	1650	AC	Pur	Pur	45	DR	Ele	46 5/8	24 1/4	22 3/4	10
1.12- .375	Alu	4.84	3.56	4	2	1.18-3.20	F	CNM	8.00	5.31	7	3.00	AB	AB	C	Pi	1650	AC	Pur	Pur	45	DR	Ele	53 9/16	24 1/4	22 3/4	11
1.50- .483	CI	6.68	9.25	4	2	1.75-3.59	F	1040	11.50	8.75	5	3.50	AB	AB	C	Pi	1600	Bur	Pur	Pur	50	LN	Ele	....	....	....	12
1.50- .483	(10)	6.68	9.25	4	2	1.75-3.59	F	1040	11.50	8.75	7	3.50	AB	AB	C	Pi	1600	Bur	Pur	Pur	50	LN	Ele	....	....	....	13
1.87- .605	Alu	8.00	6.50	3	2	2.12-4.50	F	1040	14.25	18.00	5	4.50	AB	AB	C	Pi	1600	Bur	Pur	Pur	50	LN	Ele	....	....	....	14
1.87- .605	Alu	8.00	6.50	3	2	2.12-4.50	F	1040	14.25	18.00	7	4.50	AB	AB	C	Pi	1600	Bur	Pur	Pur	50	LN	Ele	....	....	....	15
1.87- .605	Alu	8.00	6.50	3	2	2.12-4.50	F	1040	14.25	18.00	9	4.50	AB	AB	C	Pi	1600	Bur	Pur	Pur	50	LN	Ele	....	....	....	16
3.12- .875	CI	13.78	73.50	4	2	3.53-7.00	F	1045	21.00	75.50	7	6.00	AB	AB	C	Mu	3000	Bur	Bur	Pur	45	.....	Air	....	....	....	17
3.12- .875	CI	13.78	73.50	4	2	3.53-7.00	F	1045	21.00	75.50	9	6.00	AB	AB	C	Mu	3000	Bur	Bur	Pur	45	.....	Air	....	....	....	18
1.25- .453	CI	5.12	3.60	3	1	1.12-3.06	F	1045	8.75	3.56	3	2.62	AB	Hes	O	Mu	750	Op	Mic	Mic	....	Op	E-H	33 9/16	21 1/2	38 3/4	19
1.25- .453	CI	5.12	4.30	3	1	1.12-3.06	F	1045	8.75	3.56	3	2.62	AB	Hes	O	Mu	750	Op	Mic	Mic	....	Op	E-H	33 9/16	21 1/2	38 3/4	20
1.50- .450	CI	5.96	6.00	3	1	1.31-4.06	F	1045	10.50	5.31	3	2.37	AB	Hes	O	Mu	750	Op	Mic	Mic	....	Op	E-H	39 9/16	25 3/4	34 7/16	21
1.25- .375	Alu	4.87	2.56	3	1	1.00-3.50	F	1045	8.00	3.50	7	2.62	AB	Hes	O	Mu	750	Op	Mic	Mic	....	Op	E-H	39 1/2	25 3/4	34 3/8	22
1.37- .469	Alu	6.50	3.75	3	1	1.37-3.62	F	1045	10.25	5.31	7	3.25	AB	Hes	O	Mu	750	Op	Mic	Mic	....	Op	Ele	50 3/8	21 13/16	41 13/16	23
1.37- .469	Alu	6.50	4.00	3	1	1.37-3.87	F	1045	10.25	5.31	7	3.25	AB	Hes	O	Mu	750	Op	Mic	Mic	....	Op	Ele	50 3/8	21 13/16	41 13/16	24
1.37- .531	Alu	7.25	.....	3	1	1.62-4.37	F	1045	11.75	8.31	7	3.50	AB	Hes	O	Mu	750	Op	Mic	Mic	....	Op	Ele	55 13/16	25 3/4	46 3/8	25
1.37- .531	Alu	7.25	6.44	3	1	1.62-4.87	F	1045	11.75	8.31	7	3.50	AB	Hes	O	Mu	750	Op	Mic	Mic	....	Op	Ele	55 13/16	25 3/4	46 3/8	26
2.00- .656	CI	8.37	16.40	3	1	1.87-5.00	F	1045	13.25	12.20	7	4.00	AB	Hes	O	Mu	780	Op	Mic	Mic	....	Op	E-G	65 5/8	30 5/8	50 7/8	27
2.00- .656	CI	8.37	11.00	3	1	1.87-5.50	F	1045	13.25	12.20	7	4.00	AB	Hes	O	Mu	780	Op	Mic	Mic	....	Op	E-G	65 5/8	30 5/8	50 7/8	28
2.25- .710	CI	9.25	20.50	3	1	2.00-5.50	F	1045	15.37	19.60	7	3.75	AB	Hes	O	Mu	780	Op	Mic	Mic	....	Op	E-G	76	32 3/8	56 1/4	29
2.25- .710	CI	9.25	24.75	3	1	2.00-6.00	F	1045	15.37	19.60	7	3.75	AB	Hes	O	Mu	780	Op	Mic	Mic	....	Op	E-G	76	32 3/8	57 5/16	30
2.25- .710	CI	9.25	24.75	3	1	2.00-6.00	F	1045	15.37	19.60	7	3.75	AB	Hes	O	Mu	780	Op	Mic	HC	....	Op	E-G	76	32 3/8	57 5/16	31
2.75- .840	CI	11.65	50.00	4	1	2.25-7.75	F	1045	20.87	34.70	7	4.25	AB	Hes	O	Mu	1000	Op	Mic	Mic	....	Op	E-G	95 1/8	46 1/2	65 1/16	32
1.18- .298	CI	4.43	3.87	4	1	1.25-2.75	F	1045	8.50	3.18	2	1.87	AB	AB	C	Pi	2300	Bur	Cun	Cun	46	AL	E-H	20 3/8	18	32 5/8	33
1.75- .422	CI	6.12	7.87	4	1	1.75-3.50	F	1045	11.50	6.43	2	2.50	AB	AB	C	Pi	2300	AM	Cun	Cun	46	AL	E-H	27 3/8	21	38 3/8	34
1.87- .415	CI	8.18	15.00	4	2	1.81-4.21	F	1045	18.00	19.87	2	2.50	AB	AB	C	Pi	2300	AM	Cun	Cun	46	.....	Ha	49 1/2	34 5/8	28 7/8	35
1.56- .381	CI	7.25	9.0	4	1	1.75-3.50	F	1045	15.00	10.00	2	2.06	AB	AB	C	Pi	2300	AM	Cun	Cun	46	.....	Ha	40 3/4	30	24 3/8	36

DI—Direct injection
D-N—Delco-Remy or Novo
Don—Donaldson Co.
DR—Delco-Remy Div.
E-G—Electric or auxiliary gasoline engine
E-H—Electric or hand
Ele—Electric
Exc—Ex-Cell-O Corp. F—Floating
G—Auxiliary gasoline engine, electric optional
GI—Grey Iron Casting
G. M. Corp—General Motors Corp.
GS—Generating sets
H—Heat Exchanger, marine only
Ha—Hand
HC—Honan-Crane Corp.
Hes—Hesselman
HI—Horizontally In-head
I—Industrial
(k)—Hand start optional on 1, 2 and 3 cyl.
L-D—Leece Neville or Delco-Remy
LE—Lanova energy cell
LN—Leece Neville Co.
M—Marine
Mic—Michiana Products Corp.
Mu—Multiple
N—No or none
Nug—Nugent
O—Open
OP—Oilpure Refiner Co.
P—Piston
PC—Precombustion chamber
Pi—Pintle
P-S—Purolator or Stewart-Warner
Pur—Purolator Products, Inc.
R—Railcars R—Locked in Rod
Si—Single
Ss—Semi-steel (electric furnace)
T—Trucks TC—Turbulence chamber
Tr—Tractors
Uni—United Air Cleaner Div.
VI—Vertically In-head
Vik—Viking Vor—Vortex
W—Wet liners used
Wau-Hes—Waukesha-Hesselman
WGB—WGB Oil Clarifier, Inc.

GOVERNMENT AGENCIES

ICC—Interstate Commerce Commission
LLA—Lend-Lease Administration
MAB—Munitions Assignment Board (U. S.-British)
MRC—Metals Reserve Co.
NACA—National Advisory Committee for Aeronautics
NHA—National Housing Agency
NLRB—National Labor Relations Board
NMB—National (Railway) Mediation Board
NRPB—National Resources Planning Board
NYA—National Youth Administration
OAWR—Office for Agricultural War Relations
OCD—Office of Civilian Defense
ODT—Office of Defense Transportation
OEM—Office Emergency Management
OES—Office of Economic Stabilization
OOC—Office of Censorship
OPA—Office of Price Administration
OPAW—Office of Petroleum Administration for War
OSFC—Office Solid Fuels Coordinator
OWI—Office of War Information
PBA—Public Buildings Administration
PCD—Petroleum Conservation Division
PRA—Public Roads Administration
PRRA—Puerto Rico Reconstruction Administration
PWA—Public Works Administration
PWC—Pacific War Council
REA—Rural Electrification Admin.
RFC—Reconstruction Finance Corp.
RRB—Railroad Retirement Board
RRC—Rubber Reserve Co.
SEC—Securities and Exchange Com.
SCS—Soil Conservation Commission
SMA—Surplus Marketing Admin.
SSB—Social Security Board
SSS—Selective Service System
SWPC—Smaller War Plants Corp.
SWPD—Smaller War Plants Division (WPB)
TVA—Tennessee Valley Authority
USCS—U. S. Conciliation Service
USES—U. S. Employment Service
WDC—War Damage Corp.
WHD—Wages and Hours Division (Labor)
WLB—(National) War Labor Board
WMC—War Manpower Commission
WPA—Work Projects Administration
WPB—War Production Board
WRC—War Resources Council (Interior)
WSA—War Shipping Administration
WSS—War Savings Staff (Treasury)

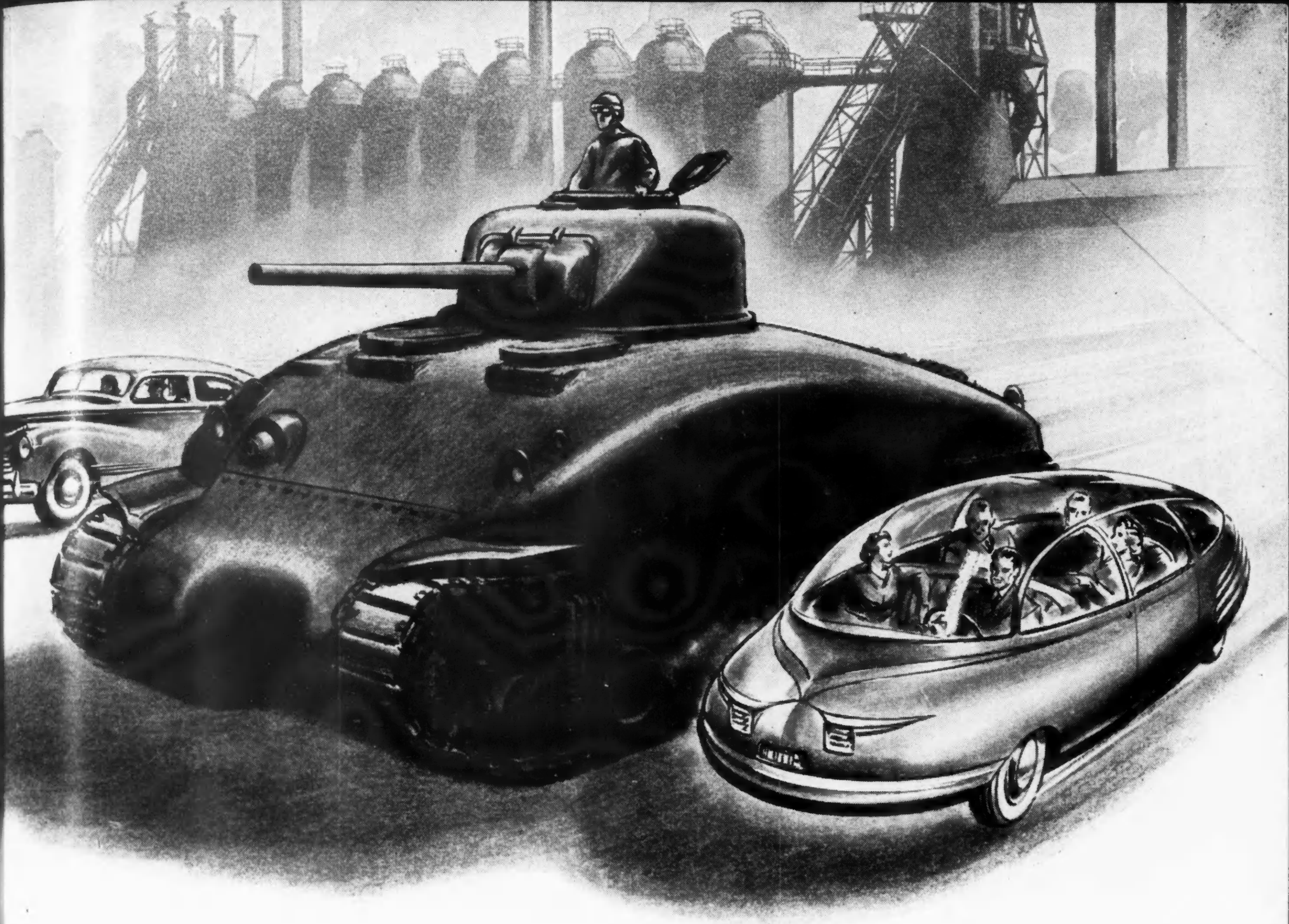
Small Gasoline Power Units

(10 Hp. or less)

MAKE AND MODEL	Designed for Use	No. of Cycles	ENGINE: Type	No. of Cylinders	Bore and Stroke (Ins.)	Total Displacement (Cu. In.)	Compression Ratio (to 1)	Valves	Horse Power: Rated at RPM	Horse Power: Continuous at RPM	Torque—Lb. Ft. at RPM	Weight (lb.)	Cooling Medium	GOVERNOR: Used	GOVERNOR: Type	Ignition System	FUEL SYSTEM: Type	FUEL SYSTEM: Make	Fuel Used	Starting Method
Briggs & Stratton (1) N	Var	4	V	1	2x2	6.28	5.86	L	1.5-3000	1.7-3600	2.9-3600	38	Air	Y	R	Mag	Car	Own	G	HC
Briggs & Stratton A	Var	4	V	1	2¼x2¼	8.95	4.26	L	1.75-2500	2.0-3200	4.3200	76	Air	Y	M	Mag	Car	Own	G	HC
Briggs & Stratton B	Var	4	V	1	2⅝x2⅝	14.21	4.47	L	2.75-2400	3.0-3200	6-3200	92	Air	Y	M	Mag	Car	Own	G	HC
Briggs & Stratton ZZ	Var	4	V	1	3x3¼	22.97	4.76	L	6-2600	6.5-3200	12.6-3200	130	Air	Y	M	Mag	Car	Own	G	HC
Cushman (2) R2½HP	Var	4	Ho	1	3½x4½	.....	4.5	IH	2.5-800	2.5-800	.....	.....	W	Y	F	Mag	MV	.....	G.D.K.	HC
Cushman R3½HP	Var	4	Ho	1	3½x4½	.....	5.0	IH	3.5-800	3.5-800	.....	.....	W	Y	F	Mag	MV	.....	G.D.K.	HC
Cushman R4½HP	Var	4	Ho	1	3¾x4½	.....	5.5	IH	4.5-800	4.5-800	.....	.....	W	Y	F	Mag	MV	.....	G.D.K.	HC
Cushman M1½HP	Var	4	V	1	2⅜x2½	11.08	4.0	L	1.5-1800	1.5-1800	.....	75	Air	Y	F	Mag	Car	.....	G	PE
Cushman M2HP	Var	4	V	1	2⅝x2½	13.53	4.5	L	2.0-1800	2.0-1800	.....	80	Air	Y	F	Mag	Car	.....	G	PE
Cushman M4HP	Var	4	V	1	2⅝x2¾	14.88	5.0	L	4.0-3600	3.0-3000	.....	85	Air	Y	F	Mag	Car	.....	G	PE
Delco (3) 4B12	Ge	4	V	1	2⅛x2¼	8.0	4.0	L	1.18-2100	.9-2100	2.9-2100	97	Air	N	.....	Bat	Car	.....	G	E
Delco 7B12	Ge	4	V	1	2 5/16x2¼	9.45	5.0	L	1.6-2300	.....	3.84-2300	104	Air	Y	F	Bat	Car	.....	G	E
Delco 2B12	Ge	4	V	1	1 11/16x1⅝	3.64	3.4	L	.....	.45-2250	1.08-2250	40	Air	N	.....	Bat	Car	.....	G	E
Delco 10EAB3	Ge	4	V	1	2¾x2 9/16	15.25	4.5	L	.....	1.85-1800	5.4-1800	.....	Air	Y	.....	Bat	Car	.....	G	E
IHC (4) LB3-5HP	Var	4	H	1	4x4⅛	51.8	4.6	IH	3.5-(a)	3.5-(a)	33.5-750	374	W	Y	F	Mag	MV	Own	G.D.K.	HC
IHC LB1½-2½HP	Var	4	Ho	1	3⅛x3¼	24.9	4.7	IH	1½-2½ (a)	1½-2½ (a)	16.5-875	194	W	Y	F	Mag	MV	Own	G.D.K.	HC
Jacobsen (5) J-100	Var	2	Ho	1	2x1½	4.7	5.0	No	1.0-3000	.....	.....	.....	Air	Y	AV	Mag	Car	Til	G	Ro
Jacobsen J-150	Var	2	Ho	1	2¼x1¾	6.95	5.0	No	1.5-3000	.....	.....	.....	Air	Y	AV	Mag	Car	Til	G	Ro
Jacobsen J-300	Var	2	Ho	1	2¾x2½	14.85	5.0	No	3.0-2600	.....	.....	.....	Air	Y	AV	Mag	Car	Til	G	Ro
Johnson Iron Horse (6) X500	Var	4	*	1	2¼x1¾	6.96	4.5	L	1.43-2600	1.27-2600	2.85-2600	44	Air	Y	C	Mag	Car	Til	G	P
Lauson (7) RLC	Var	4	V	1	1¾x1⅞	4.51	5.5	L	.76-2400	.62-2400	1.67-2400	25	Air	Y	F	Mag	Car	Z	G	P
Lauson TLC	Var	4	V	1	2¼x2¼	8.946	6.0	L	1.92-2400	1.57-2400	4.2-2400	52	Air	Y	F	Mag	Car	Til	G	HC
Lauson RSC	Var	4	V	1	2x1⅞	5.89	6.0	L	1.16-2400	.95-2400	2.5-2400	27	Air	Y	F	Mag	Car	Til	G	PE
Lauson PAC	Var	4	V	1	2⅞x2¾	17.85	6.0	L	4.0-2400	3.3-2400	8.8-2400	92	Air	Y	F	Mag	Car	MS	G	B
Novo (8) DA-33	Ge	4	V	1	3¼x4	33.0	4.5	L	4.38-1400	3.5-1400	16.4-1400	220	Air	Y	O	Mag	Car	HoL	G	HC
Novo CW-33	G,AC,P,H	4	V	1	3¼x4	33.0	5.5	L	4.2-1200	3.4-1200	18.5-1200	340	W	Y	O	Mag	Car	HoL	G	HC
Novo CW-47	G,AC,P,H	4	V	2	2¾x4	47.0	5.5	L	5.2-1200	4.2-1200	23-1200	395	W	Y	O	Mag	Car	HoL	G	HC
Novo CW-66	Var	4	IL	2	3¼x4	66.0	5.5	L	8.5-1200	6.8-1200	37.5-1200	395	W	Y	O	Mag	Car	HoL	G	HC
Onan (9) 1B	Ge	4	V	1	2¾x2¾	16.3	4.8	L	2.5-1800	2.5-1800	7.3-1800	†177	Air	Y	‡	Mag	Car	Z	G	Ro
Onan OTC	Ge	...	OP	2	2⅝x2¼	24.35	5.9	L	4.1-2850	3.4-1800	9.92-1800	†155	Air	Y	‡	Mag	Car	Z	G	Ro
Onan W3MorS	Ge	4	IL	2	3x2¾	38.8	5.5	L	7.2-1850	7.1-1800	20.4-1850	†450	W	Y	‡	BM	Car	Z	G	Ro
Onan V45	Ge	...	VEE	4	3x2¾	77.8	5.5	L	14.5-1800	14.5-1800	42.3-1800	†640	W	Y	PP	BM	Car	Z	G	HC
Universal (10) AFTC	Ge	4	V	2	3x3½	49.5	5.79	L	5.5½-1200	.....	25.0-1200	385	W	Y	M	BM	Car	S	G	HC; E
Wisconsin (11) AA	Var	4	V	1	2¼x2¾	10.9	4.4	L	2.0-2600	1.6-2600	4.75-1900	76	Air	Y	Own	Mag	Car	S	G	B
Wisconsin AB	Var	4	V	1	2½x2¾	13.5	4.4	L	3.0-2600	2.4-2600	6.75-1700	76	Air	Y	Own	Mag	Car	S	G	B
Wisconsin ABS	Var	4	V	1	2½x2¾	13.5	5.17	.....	4.0-3200	3.2-3200	6.9-2500	79	Air	Y	Own	Mag	Car	S	G	B
Wisconsin AK	Var	4	V	1	2⅞x2¾	17.8	4.6	L	4.1-2400	3.3-2400	9.5-1700	77	Air	Y	Own	Mag	Car	S	G	B
Wisconsin AKS	Var	4	V	1	2⅞x2¾	17.8	5.12	.....	5.0-3200	4.0-3200	10.0-2000	.....	Air	Y	Own	Mag	Car	S	G	B
Wisconsin ADH	Var	4	V	1	2¾x3¼	19.3	5.1	L	5.1-2600	4.1-2600	10.8-2000	125	Air	Y	Own	Mag	Car	S	G	HC; B
Wisconsin AEH	Var	4	V	1	3x3¼	23.0	5.1	L	6.1-2600	4.9-2600	12.9-2000	130	Air	Y	Own	Mag	Car	S	G	HC; B
Wisconsin AGH	Var	4	V	1	3½x4	38.5	4.6	L	8.4-2100	6.7-2200	24.2-1300	.....	Air	Y	Own	Mag	Car	S	G	HC; B
Wisconsin AHH	Var	4	V	1	3⅝x4	41.3	4.55	L	9.2-2200	7.4-2200	25.9-1400	180	Air	Y	Own	Mag	Car	S	G	HC; B
Accessory Gasoline Engines for Aircraft																				
Lawrence 30C-1 and 2	G	...	OP	2	2⅝x2¾	30.0	9.00	.....	15-4100	.....	.....	†213	Air	.....	.....	Mag	Car	S	G	.....
Lawrence 30C-3	G	...	OP	2	2⅝x2¾	30.0	9.00	.....	15-4100	.....	.....	†179	Air	.....	.....	Mag	Car	S	G	.....
Lawrence 30C-4A	G	...	OP	2	2⅝x2¾	30.0	9.00	.....	15-4100	.....	.....	†184	Air	.....	.....	Mag	Car	S	G	.....
Lawrence 30D	G	...	OP	2	2⅝x2¾	30.0	9.00	.....	15-4100	.....	.....	†190	Air	.....	.....	Mag	Car	S	G	.....
Onan IC	AG	4	V	1	2¼x2¼	8.95	5.00	.....	1.4-2100	1.0-1800	2.9-1800	73	Air	Y	‡	Mag	Car	Z	G	Ro
Onan OTC-2½	AG	4	OP	2	2½x2¼	22.08	5.50	.....	.....	3.1-1800	.....	128	Air	Y	‡	Mag	Car	.....	G	E
Onan OTC-2⅝	AG	4	OP	2	2⅝x2¼	24.35	5.90	.....	.....	3.4-1800	.....	128	Air	Y	‡	Mag	Car	.....	G	Ro
Onan OTC-2¾	AG	4	OP	2	2¾x2¼	26.73	5.90	.....	.....	3.7-1800	.....	128	Air	Y	‡	Mag	Car	.....	G	Ro
Onan OFA	AG	4	OP	4	2¾x2¼	53.46	5.90	.....	.....	7.0-1800	.....	260	Air	Y	‡	BM	Car	.....	G	Ro
Onan VFA	AG	4	V90	4	3x2¾	77.80	5.50	.....	.....	14-1800	.....	350	Air	Y	PP	BM	Car	.....	G	HC; B

ABBREVIATIONS

*—Cylinder 60° from vertical
†—Weight includes generator
‡—Flyweights in cam gear
(a)—600-1000
AC—Air Compressors
AG—Aircraft Generators
AHU—Aircraft Heater Units
AV—Air Vane
B—Belt
Bat—Battery
BM—Battery or Magneto
C—Centrifugal
Car—Carburetor
E—Electric
F—Flyball
G—Generator
H—Hoists
HA—Home Appliances
HC—Hand Crank
Ho—Horizontal
Hol—Holley
I—Industrial
IH—In Head
IL—In Line
L—L-head
M—Mechanical
Mag—Magneto
MS—Marvell Shebler
MV—Mixing Valve
N—No or None
OFP—Oil Field Pump
Op—Opposed
P—Pump
Pe—Pedal
PP—Pierce
P—Pneumatic
RE—Refrigeration Equipment
Ro—Rope
S—Stromberg
Til—Tillotson
V—Vertical
Var—Various
W—Water
Wi—Wisconsin
Z—Zenith
(1)—Briggs and Stratton Corp
(2)—Cushman Motor Works
(3)—Delco Appliance Dir; General Motors Corp.
(4)—International Harvester Co.
(5)—Jacobson Mfg. Co.
(6)—Johnson Motors Division
(7)—Hart-Carter Company
(8)—Noro Engine Company
(9)—D. W. Onan & Sons
(10)—Universal Motor Co.
(11)—Wisconsin Motor Corp.



New Products

Powdered Metal Parts

Keystone Carbon Company, St. Marys, Pa., has enlarged its operations in powder metallurgy to include production of small parts of special design and shape. Parts which formerly required such operations as turning, milling, drilling and reaming are produced at Keystone Carbon Company by powder metallurgy in which metal powders are molded to exact size and shape in one operation. Small parts currently being produced are cams, eccentric parts, levers, rotors and slide blocks.

Small part produced by Keystone Carbon Company.

Gum Solvent for Hydraulic Systems

A gum solvent in concentrated form, which is added to the oil in a hydraulic system whenever there is evidence of poor indexing or improper operation, obviates flushing and loss of production time. It is a product of E. F. Houghton & Co., Philadelphia, Pa., and is used in proportions of 3 to 5 per cent of the oil in the system. Known as Gum Solvent "B," it is said to put any accumulation of sludge, gum or contamination into solution, leaving the hydraulic system clean when the worn oil is later drained. Changing the oil becomes only a matter of draining the hydraulic line and refilling with fresh oil.

Two New Bakelite Molding Plastics

The Bakelite Corporation, New York, N. Y., has announced two new "Bakelite" phenolic molding materials, No. BM-13017 and No. BM-16034. The former is designed especially for the production of aircraft and automotive ignition parts. The material is natural colored and is said to be highly suitable for extrusion molding around inserts. The other phenolic molding plastic, No. BM-16034, was developed for long flow extrusion work and for transfer molding.

Carbon Met. Replaces Carbon Tetrachloride

A substitute for carbon tetrachloride as a solvent and cleaner is being offered by The Curran Corporation, Malden, Mass. The newly developed product is described as a volatile, water-white methalated hydrocarbon solvent which evaporates clean and is non-flammable and non-explosive. It is a "Non-Polar" solvent and does not tend to rust or corrode ferrous metals. The makers state that it is lower in cost and less toxic than carbon tetrachloride.

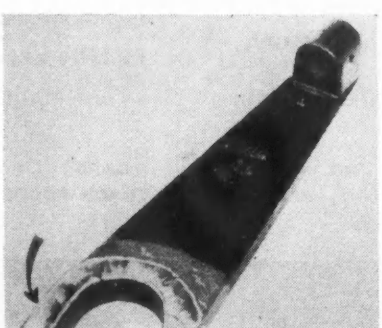
War Steptread Cement

War steptread cement, used to attach rubber to metal, has been developed by the Goodyear Tire & Rubber Company, Akron, Ohio, to replace the regular steptread cement which contained materials no longer availale for non-essential use.

The new war steptread cement is made of non-strategic materials and is a satisfactory substitute for regular steptread cement. It is said to be highly adhesive and resistant to weather exposure.

Alloy for Reclaiming Worn Machine Parts

Duraface, a ferrous base alloy, is supplied by the Eutectic Welding Alloys

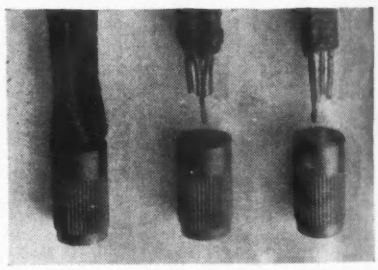


Machine part built up with Duraface

Co., New York, N. Y., in two grades, No. 1 for gas welding, and No. 2 for a.c. or d.c. application. It is used for building up worn surfaces on steel, cast iron or malleable iron. Duraface No. 1 has a hardness of 450-500 and a tensile strength of 50,000 p.s.i.; No. 2 has a hardness of 575-675 and a tensile strength of 50,000 p.s.i. The hardness may be increased by rapid cooling.

No Solder Needed With "Wire-Nuts"

Ideal "Wire-Nuts," made by the Ideal Commutator Dresser Co., Sycamore, Ill., do not use tin, lead or rubber as do solder and tape joints in wire, thus their availability is not affected by a shortage of these materials. They consist of a cone-shaped spiral spring insert, imbedded in molded insulating material. The joint is made by stripping the wires about ½ in. and screw-



"Wire-Nuts" made by Ideal Commutator Dresser Co.

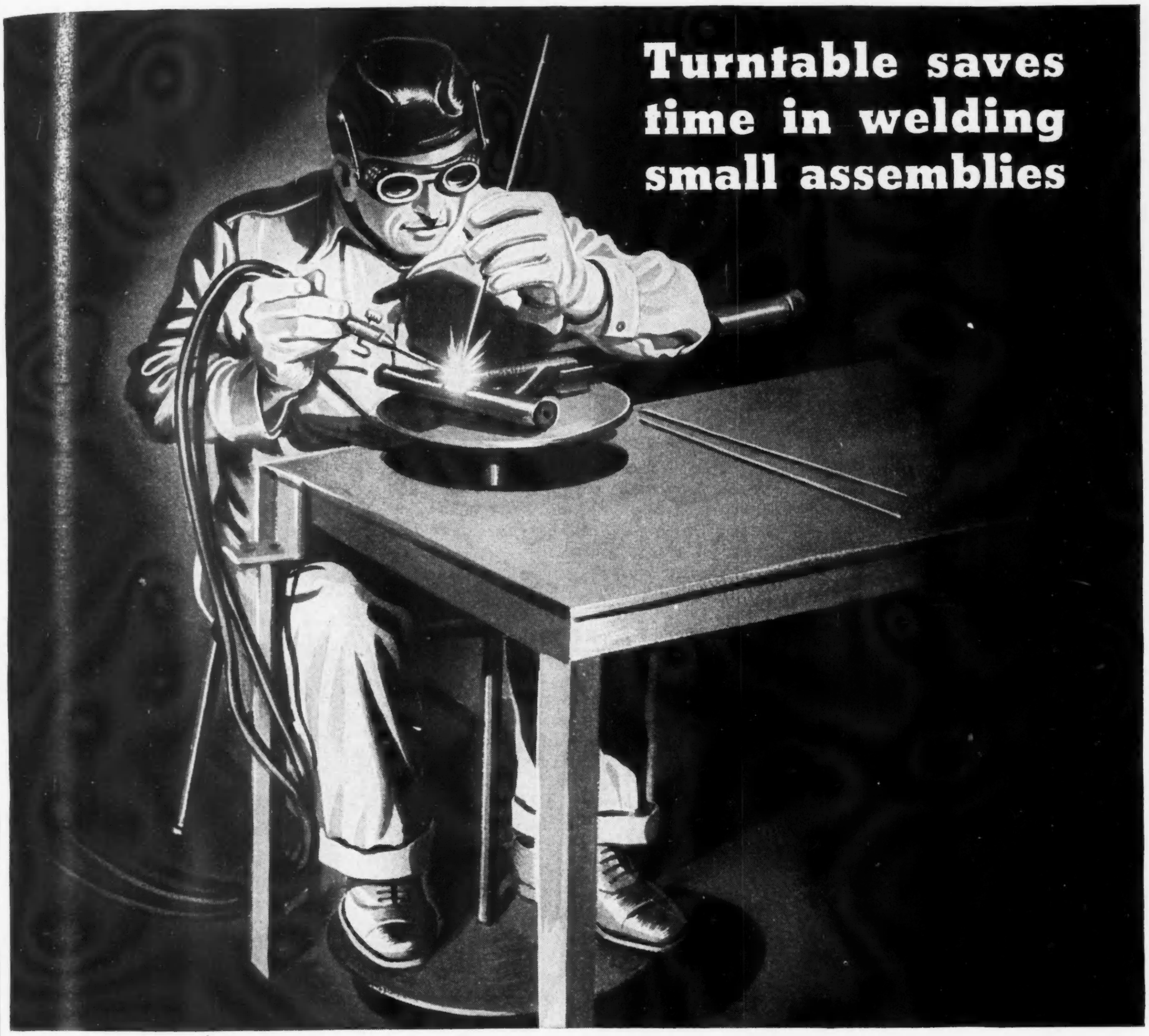
ing the "Wire-Nut" on the stripped ends. "Wire-Nuts" are said to be practically indestructable, the insulation will not melt, and the molded shell eliminates any possibility of the wire ends protruding and piercing through. They are made in five sizes for making all combinations of wires from two No. 18 to three No. 10, solid or stranded.

Gem-Quality Synthetic Corundum Available

Synthetic white sapphire, the mineral corundum unpigmented and of gem quality, is available in the form of boules from The Linde Air Products Company, New York, N. Y. The boules, the form in which the sapphire is manufactured, each weigh at least 150 carats

(Turn to page 244, please)

Turntable saves time in welding small assemblies



Information supplied by an Industrial Publication

Several means are being applied industrially to save time and reduce fatigue of welders working on heavy jobs. Positioning tables, rotating jigs and similar devices for handling heavy or bulky assemblies are quite generally used.

One aircraft manufacturer has adopted a similar idea for welders working on small sub-assemblies. The assemblies are light, and joints are usually quite accessible. But moving the assemblies by hand does occasion some delay.

This is obviated by mounting the work on a small turn table somewhat resembling an old style potter's wheel. The turn table is quite simple, consisting of two round plates mounted on a common shaft.

The upper plate carries the work, and is located at a convenient height above a work table. The lower plate is a few inches above the shop floor. It is positioned so that the operator's feet rest on it comfortably.

Thus, when the operator wishes to move the work, he simply "indexes" the lower table by foot power. The weight of his feet on the plate is, however, sufficient to hold the whole turn table steady while he is welding any particular joint.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

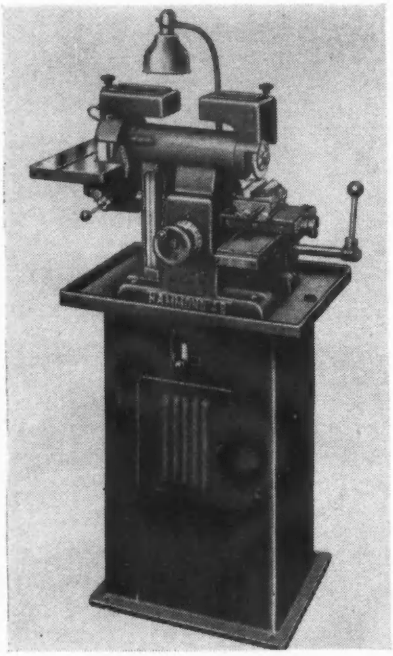
MOLYBDIC OXIDE BRIQUETTES • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

MOLY

Climax Mo-lyb-den-um Company

500 Fifth Avenue • New York City

New Production Equipment



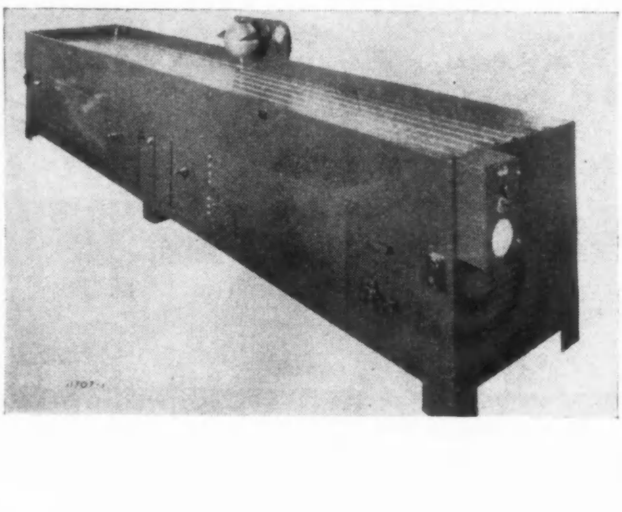
Hammond Model 4-B Combination Chip Breaker and Cup Wheel Grinder.

Two new belted type carbide tool grinders have been brought out by Hammond Machinery Builders, Inc., Kalamazoo, Mich. The Model 4-B combination chip breaker and cup wheel grinder is equipped with ball-bearing spindle and oversize bearings which are permanently grease sealed. A brake is provided which quickly stops the wheels when reversing on single phase current. Drip feed tanks with adjustable valves for diamond wheel grinding are integral parts of the wheel hood construction and accommodate either 4-in. or 6-in. diameter wheels. An angle vise is one of the features of the Hammond 4-B. It is of double cradle design, which upon setting can be instantly locked by means of thumb levers. The vise jaws are 3 in. long, and the space between them is 1 9/16 in.

The left side of the machine is equipped with a silicon carbide cup wheel which makes it a combination machine for complete carbide tool maintenance. This side is provided with an 8-in. by 14-in. tilting table, adjustable to any angle between 25 deg. below horizontal and 15 deg. above horizontal.

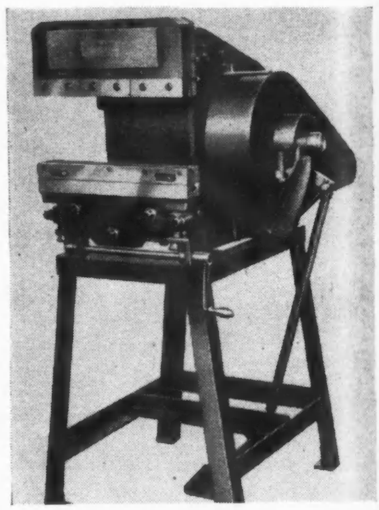
The Hammond Model 6-B carbide tool grinder is of the same general construction, except that it provides cup wheels on both ends of the spindle and has 8-in. by 14-in. surface ground tilting tables at both sides of the machine.

A hydraulic test bench that can be used by two operators at a time, and in an emergency by a third, has been brought out by the Hydraulic Machinery Company, Dearborn, Mich. It is known as the Model T-102 stationary hydraulic test bench, and can be used to check all types of hydraulic equipment before its assembly into aircraft. Pressures of zero to 10,000 p.s.i. are available for testing hydraulic tubing, and a variable delivery pumping unit supplies fluid from zero up to 12 gallons per minute. The air-oil accumulator is used for checking aircraft valves as well as charging the accumulators on the planes, and can be operated at a maximum test pressure of 1,000 p.s.i.



Model T-102 Stationary Hydraulic Test Bench

The Whitney-Jensen No. 247 Press Brake was developed to meet the demand for a small press brake suitable for moderate sized work in jobbing and production shops. It has a bending capacity of 14 ga. mild steel over ⅞ in. V-die, operates at 72 strokes per minute, and has a length of stroke of 1 in. Die space above die holder is 6½ in., die space with die holder removed is 8⅛ in., and length of die bed is 18 in. The No. 247 Press Brake is equipped with a push-button switch, with overload protection. The ram is tripped by the conventional foot treadle at the front of the base. Motor, flywheel, clutch, and all control linkages are mounted on right-hand side of the machine. The ram and die shoe are machined for standard dies.



Whitney-Jensen No. 247 Press Brake

The Fellows Gear Shaper Company, Springfield, Vermont, has recently placed on the market two new devices for checking gears. One of the fixtures, known as a cone-pointed testing fixture, is used for checking concentricity of the pitch circle; the other fixture is used for checking the circular pitch, or tooth to tooth spacing. Both fixtures

(*Turn to page 242, please*)


For pressure-tight... leak-proof unions!
Pressure-tight and leak-proof assemblies are of vital importance to the efficiency and proper maintenance of trucks, buses, planes, tanks, tractors, boats, diesel engines, pumps, pipelines and industrial machinery.
Permatex Form-A-Gasket No. 1 . . . Form-A-Gasket No. 2 . . . Aviation Form-A-Gasket and Pipe Joint Cement are as important as tools a mechanic uses to do the right job on gasket assemblies, flange unions, threaded connections, pipe joints and many other assemblies.
These Permatex sealing compounds are leak-proof to gasoline, kerosene, fuel oil, hot or cold lubricants, hot or cold water, salt water, illuminating gas, ethylene glycol, glycerine and numerous other liquids and gases.
Permatex Form-A-Gasket No. 1 is a soft paste that dries fast and sets hard.
Permatex Form-A-Gasket No. 2 is a soft paste that dries slowly and remains pliable.
Permatex Aviation Form-A-Gasket is a heavy liquid that does not dry and does not run. Readily brushable and self-levelling.
Permatex Pipe Joint Cement is a heavy liquid that does not dry or crack. Applied with a brush. Permits easy readjustment. Disassembles readily.
PERMATEX
NUMBER 1
FORM-A-GASKET
NUMBER 2
AVIATION
FORM-A-GASKET
PIPE JOINT CEMENT
PERMATEX COMPANY, INC.
Sheepshead Bay, N.Y., U.S.A.

New Products for Aircraft

Winter Tire For Aircraft

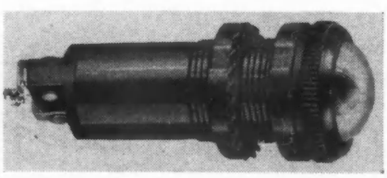
A "winter tire" for aircraft, having parallel rows of steel coils embedded in the tread, has been brought out by the B. F. Goodrich Company, Akron, Ohio. The rows of steel coils are bonded to the rubber around the circumference of the tire during vulcanization. A new

Goodrich "Winter Tire" for Aircraft

method of tire construction had to be developed to accomplish the bonding. Skid resistance is necessary in airplane tires not only to give traction as the brakes are applied to stop a plane after it has landed, but also to facilitate skid-free take-offs.

Signal Indicator for Use in Aircraft

A signal indicator for use in aircraft wherever a signal light is used, is being introduced by Littlefuse Incorporated, Chicago, Ill. It is the Littlefuse No. 1534 Signalette, and is said to work in daylight, under "black light" and no light. Indication by this unit is entirely by reflected light and radio activity. The Signalette operates by fluorescence



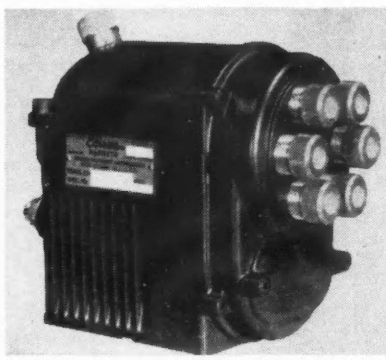
Littelfuse Signalette No. 1534

under "black light" from the usual sources within aircraft. A radium-active fluorescent paint used on the indicator shows signals in total darkness. Indication is free from glare in daylight as well as night-time use.

The body of the Signalette indicator houses a solenoid, the armature of which is connected with the butterfly indication vanes by a lever hook-up. The fluorescent butterfly opens instantly to show signals, reflecting the proper indicating light. Butterflies are furnished in red, amber and green. When not indicating, the Signalette is black.

Trainer Plane Magneto

The Edison Jr. aircraft magneto, SF and SB series, has been developed by the Edison-Splitdorf Corporation, West Orange, N. J., to meet the requirements of modern aircraft engines of moderate size and horsepower. The instrument is of the rotating magnet type, and al-

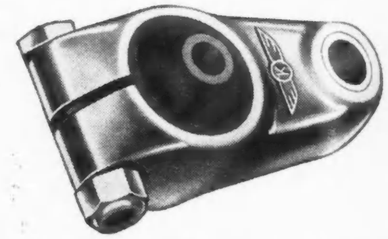


Edison-Splitdorf Aircraft Magneto

though the weight is only five lbs., it is said to maintain full electrical output, mechanical strength, and all around efficiency. The die-cast aluminum housing is a single unit, free of joints or screws, and the magneto is completely radio shielded.

New Cowl Ring Connector Link

The Kinney cowl ring connector link for aircraft incorporates a rubber bushing that absorbs engine and flight vibration, and has a rocker arm action, or compensating principle, that takes up normal engine heat expansion. The Kinney Engineering Company, Los Angeles, Cal., makers of the device, claim



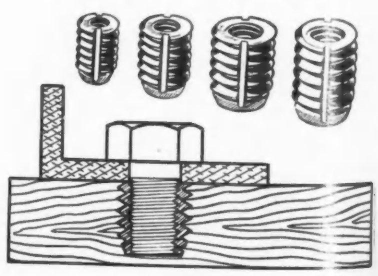
Kinney Engine Cowl Ring Connector Link.

that these features make possible a flexible, vibration-absorbing link of unusual strength that will eliminate split cowling failures caused by excessive vibration transmitted from the engine to the cowling by the rigid type connector link.

Screw-In Type Anchor Inserts

Asco Inserts are screw-in type blind anchor inserts for bolting metal to wood without going all the way through the wood. They are supplied in four standard sizes by Aircraft Specialties Co., Los Angeles, Cal. The inserts are designed for use in wood-and-metal fabrication, such as production of plastic-plywood airplanes, and may also be used in plastics or soft metals. Only one hole needs to be drilled in wood before installing the insert, as it taps

(*Turn to page* 240, *please*)



Asco Inserts

Design Changes Large Factor In Aircraft Production Rate

Industry Meeting Changing Combat Conditions
Two Big Units Producing at $4\frac{1}{4}$ Billion Rate

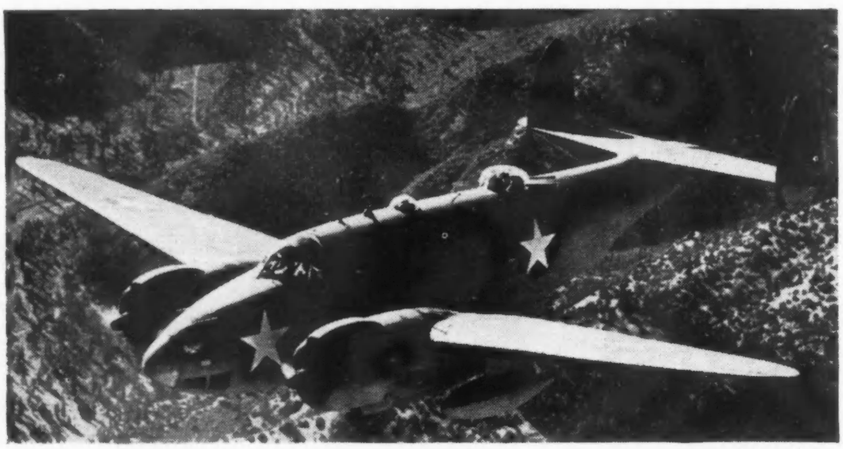
Design changes, admittedly an important factor in the production difficulties at Willow Run, also have hampered the output of Martin B-26 Marauder medium bombers at the new government-built Glenn L. Martin - Nebraska Co. plant at Omaha. Final assembly takes place in this plant from sub-assemblies made by the automotive and tires industries—the front portion of the fuselage by Chrysler Corp.; the rear fuselage section by Hudson Motor Car Co. and the wings by Goodyear Aircraft Corp.

"Production of completed planes has not come up to initial expectations," according to an announcement by Col. George E. Strong, of the Central Procurement District of the Army Air Forces at Detroit, "but it is now evident that original schedules were too optimistic. The new Marauder's original design incorporated many unique features. However, shortly before the Omaha assembly plant was to begin quantity production, combat experience became available, dictating important changes in the airplane; included among these were an increased number of guns of larger calibers, disposed so as to provide greater striking power, as well as larger wings and control surfaces designed to improve the handling qualities of the aircraft. In this connection it must be noted that the Marauder, an aircraft of recent design, had not completely gone through its 'growing pains' when production was about to begin at Omaha. Accordingly, the modifications found necessary to meet combat requirements had to be incorporated in the airplane at a critical time, thus causing delay in its production program. . . ."

"Essential modifications were numerous and both Hudson and Chrysler were ordered to decelerate new production and to set up modification lines for altering previously completed parts. By late summer of 1942, Hudson was approximately 300 per cent ahead of scheduled deliveries, Chrysler was 500 per cent ahead and Goodyear had overcome its difficulties. Martin-Nebraska encountered numerous problems to effect the assembly program. Operations began several months before the plant was officially accepted in August, 1942. With activities tremendously expanded in Martin's main plant in Baltimore, there was a minimum of trained personnel available to Omaha from this source. Thousands of agricultural area workers had to be hired and trained. The plant had to be tooled up at a critical time. The late 1942 picture was that Chrysler, Hudson and Goodyear were producing their respective sections at a rate far in excess of the number that could be assembled at the Martin - Nebraska plant. Martin - Nebraska's assembly capacity was taxed by the latest modifications which had to be incorporated in these ships, in addition to the modification work which they were carrying on in connection with Martin Baltimore-produced aircraft."

"On the basis of results directly at

(*Turn to page 140, please*)



International

The Vega PV-1

This twin-engined, land-based patrol plane is one of the Navy's newest weapons for use against submarines. It carries "ash can" depth charges, or torpedoes. Under-wing tanks carry extra fuel for long flights.

In Tune With the Times

This, the 25th Annual Statistical Issue of AUTOMOTIVE AND AVIATION INDUSTRIES, is appropriately broader in scope than any of its twenty-four eminent predecessors. The hope and confident expectation is that it will prove even more valuable in content. It is tuned to the times. It is designed to be helpful to industrialists, production men and engineers in the automotive and aviation industries who are, today, devoting their ingenuity and energies, their thinking and planning to considerations that are fundamentally broader and more immediately and definitely essential not only to the life of America, but also to the preservation of the free enterprise system which has made America great.

For the compilation and presentation of the voluminous and vitally important statistical material in this issue, credit is appreciatingly accorded to Marcus Ainsworth, Statistician of AUTOMOTIVE AND AVIATION INDUSTRIES.

Uniform Gaging Practices Proposed

As a means of making uniform the gaging practices employed in inspection of precision parts of war equipment, the Automotive Council for War Production has proposed that the American Standards Association undertake an intensified standardization program for all American industry, according to an announcement by George Romney, managing director of the Council.

The proposal is intended to accelerate the development of a new standard for specifying fits and tolerances and methods of gaging inspection and gage control.

Men with Mathis

E. C. Mathis, president of Matam Corporation, Long Island City, New York, announces that associated with him in that enterprise are Raymond E. Duboc, vice-president, who was formerly of Citroen in France; Albert D. Glowinski, vice-president, and Robert Beauvais, director of research, who were formerly of Gnome et Rhone Aviation in France. The Matam Corporation is now engaged in manufacturing ordnance material for the U. S. and the other allied armed forces.

Mr. Mathis, in France's happier days, was president and chairman of the board of Mathis S. A., France, and of Matford. The Mathis car was one of the best known and most widely distributed products of the French automobile industry. Just before Hitler's hordes entered France, Mr. Mathis ordered the complete dismantlement and destruction of the huge Mathis Motor Works in Strasbourg to prevent their falling into the hands of the Germans.

Patent Licensees' Rights Protected

Leo T. Crowley, Alien Property Custodian, has announced that vesting by his office of patents of foreign nations did not mean that rights of American licensees under seized patents were likewise vested.

The announcement is based upon an opinion of the General Counsel to the Office of Alien Property Custodian which holds that an American licensee under a vested patent or patent application need not file a Form APC-1 to assert his claim to rights under his license.

The opinion holds, further, that an American licensee under seized foreign patents or patent applications cannot be prejudiced by his failure to file a claim within one year of the date the patent or patent application is vested. The opinion applies equally to exclusive and non-exclusive licenses.

The announcement does not relieve any American licensee from complying with the reporting or other requirements of APC General Orders Nos. 2, 11 and 12 and the regulations thereunder whenever such orders and regulations are applicable.

Alloy Steel Scrap Must Be Segregated to Conserve Alloys

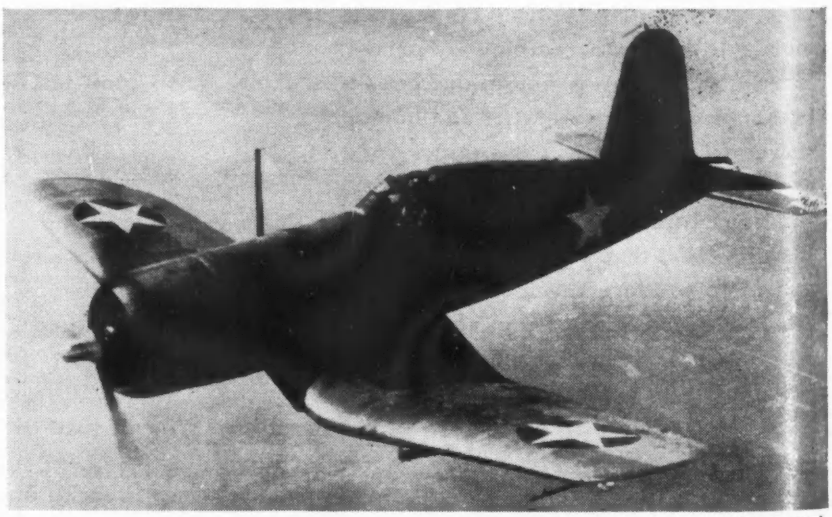
Copper Base Scrap Containing Beryllium to be Remelted for Use in Beryllium Copper Only

By W. C. Hirsch

While some steel company executives profess to see a tapering off in war steel commitments already under way, others ascribe the mild recession of backlogs to the closer fit between requirements and output which is the objective of the Controlled Materials Plan and which, they say, will become more and more noticeable from now on. Be that as it may, war equipment manufacturers continue to clamor for a stepping up of alloy steel deliveries. Whatever easing off in the situation with reference to plain carbon steels may result from improved control of the flow of material under CMP regulations, the supply of alloy steels will depend to a considerable extent upon the success of the methods now being used to conserve the alloy content of every pound of scrap. One of the large steel producers is conducting a vigorous campaign of education with the admonition that "fabricators must segregate alloy steel scrap—or schedules may collapse." Says this appeal to alloy steel converters: "Alloy steels cannot be made without nickel, chromium, molybdenum or other critical alloying elements. And such materials are scarce—growing scarcer every day. There just isn't enough to go around now. We must reclaim every possible ounce of alloy from steel scrap. Every time you machine alloy steels, substantial quantities of alloying elements go into the scrap pile. But unless you keep each lot of alloy steel chips, turnings, shearings and other scrap separate, segregated at the machine and correctly labeled with its grade number (SAE, AISI, NE or other), the maximum value of those alloys may be wasted, even lost."

With the same objective, that of conserving important alloy elements in mind, the Director General for Operations of the War Production Board has ordered that copper scrap and copper base alloy scrap containing 0.1 per cent or more beryllium be remelted only for use in beryllium copper products and, therefore, is to be delivered only to persons authorized by WPB to receive such scrap. American Iron & Steel Institute metallurgists suggest that steel buyers suspend the usual peace-time practice of specifying precise chemical composition and inform steel suppliers instead of the mechanical properties desired, thus permitting in all probability in many steels the substitution of suitable heat treatment for what had been thought to be indispensable alloying elements, all of which are on the list of critical materials. These moves simply add up to clearer recognition of the need of conserving every pound of alloying material and restricting its use to products in which it cannot be replaced. To the same end OPA has sanctioned a $2 per ton addition to base prices for the nickel content of pig iron, produced in blast furnaces from turnings that result from the manufacture of guns, shells, and armor of high alloy steel. The pig iron can be charged directly in the steel furnace, transmitting the nickel without loss to the steel. The nickel content ranges from one-half to one and one-half per cent and proportionately higher premiums for nickel content in excess of 0.75 per cent are authorized.

WPB is reported to have received numerous requests to ease restrictions on the use of tin in view of the comforting supply situation, but the authorities are determined to maintain this condition by permitting no tin to be diverted to other than the most important uses in furtherance of the war effort.



International

The Goodyear FG-1

This Akron-built single-seated fighter is said to have a top speed of nearly 400 miles per hour, a comparatively low landing speed, and a ceiling of 35,000 feet. It has a wing spread of 41 feet, a length of 33 feet, and a height of 16 feet.

Ford Building Amphibian Jeep

Ford Motor Co. is in volume production on the amphibian jeep, a heavier sea-going version of the land jeep which has become standard equipment for the U. S. Army as well as for armies of other of the United Nations throughout the world. The steering gear installation is a somewhat intricate one on the production line because it serves not only for steering the front wheels on land but also for controlling the rudder in the water. The vehicle can carry as many as five persons in the water. When the jeep leaves the land to enter the water, the driver shifts from the conventional four-wheel or rear-wheel drive to the propeller drive.

New Contracts and Commitments

General Motors Corp. has received contract increases totaling nearly $12,000,000 from the Defense Plant Corp. for additional plant facilities in six states. An increase of $9,925,000 has been granted for additional equipment in Ohio, Tennessee and Michigan, bringing the overall commitments on these projects to $27,000,000. Additional plant facilities in New Jersey, New York and Maryland have been authorized to cost $1,290,000, boosting the total commitment to $10,850,000. Another contract boost of $730,000 will provide more facilities for a GM plant in New Jersey, raising the total cost to $7,275,000.

Douglas Aircraft Co., Inc., has received a DPC grant of approximately $3,890,000 for additional facilities at a plant in California, raising the total to $6,135,000. Curtiss-Wright Corp., Buffalo, has received authorization for plant facilities in New York costing approximately $4,000,000, bringing the total commitment to $36,900,000. SKF Industries, Inc., Philadelphia, has an authorization approximating $3,000,000 for plant facilities in Pennsylvania, the overall commitment now being $12,000,000. Rohr Aircraft Corp., Chula Vista, Cal., manufacturer of airframe parts, has been granted a contract increase of $640,000, raising the total to $2,500,000.

Manpower Becoming Greatest Problem In War Production

Manpower Utilization Division Is Set Up by Automotive Council for War Production

Manpower is reaching the point where it is about to supersede material and machines as the No. 1 problem in U. S. war production. In order to approach this problem on a realistic basis in making the fullest use of available manpower, the Automotive Council for War Production has set up a Manpower Utilization Division. The directing committee of this division will be headed by Charles E. Wilson, president of General Motors Corp., and will be composed of 17 other ranking executives in the industry who are close to the labor problems involved. Through interchange of information on an industry-wide basis, the division will set up a program similar to those previously undertaken by the ACWP on plant conversion, machine tool listing and utilization of materials.

In explaining the objectives of the new division, Alvan Macauley, president of the ACWP, said, "Through the Council, the companies that have developed and proved methods for handling such problems as absenteeism, training, transportation, health and safety, employment of women workers and improved production schedules will share the benefit of their experience with all other companies in the industry. All desirable methods that assist the worker in increasing the output of war goods will be analyzed by specialists and passed on to the industry as a whole. . . . The industry for some time has devoted its technical ingenuity and skill to producing more and more from less and less—in terms of materials. From this time forward the industry's major objective will be to produce more and more with the workers available."

The new committee will serve more as a fact-finding body to develop and pass along ideas and suggestions gained from operating experience on the most efficient use of manpower. The subject of incentive plans to increase productivity may be discussed but the committee will not undertake to help solve the labor relations problems of the companies with the unions. That is an individual problem which each company must work out itself. A survey made by the ACWP in 16 plants revealed that nearly every worker wants to contribute more to the war effort. Sometimes they are prevented from doing so by union attitudes or a feeling that they will work themselves out of material and hence out of work. The survey showed that the workers desire better plant discipline. They also are generally ignorant of the need for balanced production of war materials and they fail to understand material shortages and the fluidity of modern warfare. The new committee will endeavor to do an educational job along this line in helping companies explain to their workers the many problems involved in scheduling modern war production.

Members of the new committee headed by Wilson are W. F. Armstrong, vice-president of Nash-Kelvinator Corp.; C. C. Carlton, vice-president of Motor Wheel Corp.; G. T. Christopher, president of Packard Motor Car Co.; W. J. Corbett, vice-president of Sparks-Withington Co.; R. H. Daisley, vice-president of Eaton Mfg. Co.; F. L. Fralick, vice-president of Koestlin Tool & Die Corp., Detroit; B. F. Hopkins, president of Cleveland Graphite Bronze Co.; R. G. Martin, president of Electric Auto-Lite Co.; G. W. Kennedy, president of Kelsey-Hayes Wheel Co.; M. J. LaCroix, International Harvester Co.; E. A. Clark, vice-president of Budd Wheel Co.; C. J. Reese, president of Continen-

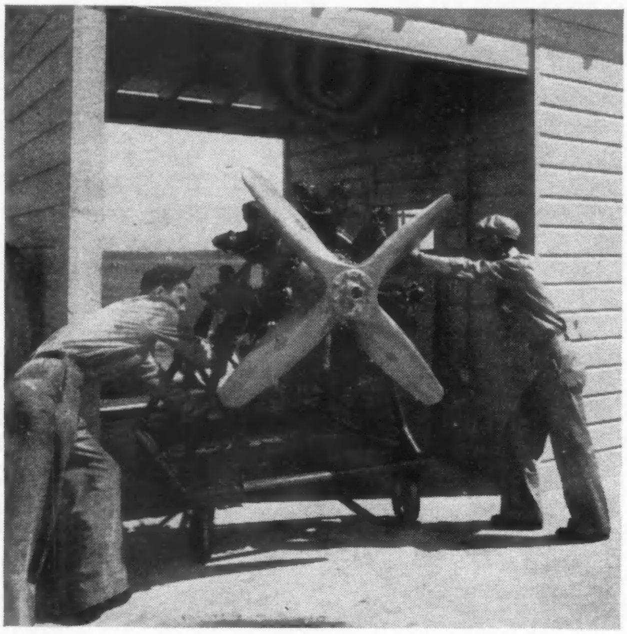
(*Turn to page 146, please*)

To Revise ASME Manual

A committee of the American Society of Mechanical Engineers at present is engaged in a revision of the Society's Manual on the Cutting of Metals. The present edition, published in 1939, deals with factors influencing the cutting of metals, tabular data on cutting speeds and horsepower for various feeds and depths of cut when cutting steel and cast iron, and methods of calculating cutting speed, chip pressure, horsepower and economic tool life for given conditions. The committee invites helpful suggestions and pertinent data which may be addressed to its chairman, Dr. M. Martellotti, and mailed to the society at 29 W. 39th Street, New York.

Filling craters made by a simulated bomb explosion, engineers at Westover Field use light tractors that were brought to the scene of the explosion by plane.

Acme



A portable test stand which saves approximately one man-hour work per engine being used to test a Continental R-670-5 engine at the Memphis headquarters of Chicago & Southern Air Lines.

Design Changes Large Factor in Aircraft Production Rate

(*Continued from page* 134)

tributable to the automotive industry, I feel that this new program is entirely sound," Col. Strong concluded.

G. T. Willey, newly appointed general manager of the Martin-Nebraska plant, commented that as the design of the B-26 becomes more stabilized, difficulties in design changes should lessen and the automobile companies should be able to produce an even flow of assemblies.

General Motors delivered $1,913,464,000 worth of war materials after price reductions during 1942, according to C. E. Wilson, president. Price reductions totaling $169,178,141 accounted for volume falling below the initial estimate of $2,000,000,000. These reductions were effected through savings brought about by improved designs, more efficient manufacturing processes, savings of material and substitution of less expensive materials without lessening and sometimes improving quality. Monthly armament output gained steadily during the year from $70,959,710 in January to a peak of $286,478,679 in December. The latter is at an annual rate of more than $3,250,000,000. January shipments declined slightly to $253,795,195.

War product sales of the Chrysler Corp. in 1942 totaled $547,995,312, according to President K. T. Keller. This was 88 per cent of the corporation's gross sales. Backlog as of Jan. 1 stood at $1,352,000,000 and current output is at an annual rate of $1,000,000,000. Eighty-six per cent of the corporation's automotive manufacturing machinery has been adapted for war work and 82 per cent of Chrysler-owned floor space is similarly employed. In addition, 7,106,544 sq. ft. of floor area and 16,374 machines are being provided by the government in plants like the Detroit Tank Arsenal and the Dodge-Chicago plant.

Goodyear Aircraft Corp., already making wings for the B-26, is also producing a new type fighter plane for the Navy. First production model of this aircraft, the FG-1, recently took the air in test flights at Akron. This plane, produced to the design of the Vought-Sikorsky Corsair, is powered by a Pratt & Whitney Double Wasp 2000-hp. engine. It has a wingspread of 41 ft. and the fuselage is 33 ft. long. Its speed is in the 400-m.p.h. class and it has a service ceiling of 35,000 ft. Goodyear is producing these planes in a new plant, begun in February, 1942, and containing more floor space than the giant Akron airdock, now converted to aircraft manufacturing operations.

Studebaker Corp., one of the largest builders of aircraft engines in the automotive industry, has received a commitment of $11,200,000 from the Defense Plant Corp. for additional facilities in Illinois. This brings the total commitment on this contract to $83,750,000. Studebaker is assembling Pratt & Whitney 1250-hp. bomber engines in South Bend, with parts made in Chicago and Fort Wayne, Ind.

Latest mobile weapon produced by the automotive industry is the M-10 tank destroyer, now being turned out by Fisher Body Division of GM at Grand Blanc, Mich., and by Ford Motor Co. at Detroit. The M-10 already has seen action in North Africa against Marshal Erwin Rommel's armored divisions. Although built on an M-4 chassis, it is somewhat lighter and faster than the M-4, has a lower silhouette and carries greater firepower, mounting a 3-inch high velocity gun. The M-10 is of welded design, with sloping armor plate to deflect enemy shells. Some of this armor plate is demountable to permit greater mobility. It teams with the M-4 in operations against enemy armored units.

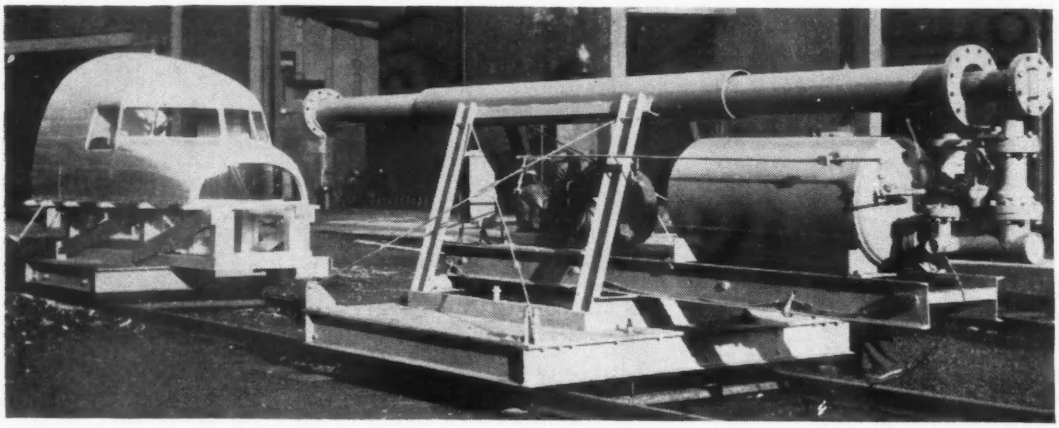
Lieut.-Gen. Jacob L. Devers, chief of the U. S. Armored Forces, commented favorably on the M-10 on a recent visit to the Tank-Automotive Center at Detroit, whence he came shortly after returning from North Africa, where he saw U. S. and British troops in action against the Nazis. Bringing back some suggestions for perfecting U. S. mobile equipment, Gen. Devers said these were merely week-end headaches for the industry, like improving a $1 part on a $100,000 tank. He said the firepower of U. S. tanks and armored vehicles was satisfactory but that the objective must be seen in order to shoot at it. Both the gasoline and diesel-powered U. S. tanks are in action in North Africa, according to Gen. Devers. Brig.-Gen. G. M. Barnes, chief of the Technical Division of the Ordnance Dept., also was in North Africa and brought back suggestions for improvements that will be put into effect by engineers of the Tank-Automotive Center and the automotive industry.

Contsant changes in combat conditions are reflected in industry, a fact which is illustrated by the case of the Saginaw Steering Gear Division of GM. This plant was a volume producer of .30-cal. machine guns, but its large output, coupled with increasing emphasis on heavier weapons, has brought a reduction in schedules. To compensate for this, the division has been awarded a contract to manufacture a U. S. Army carbine which has been found very effective against the Japanese in jungle battle areas such as those in the islands of the Southwest Pacific. No loss of employment is expected at Saginaw due to the rapid changeover to manufacture of the carbines.

California Leads In War Contracts

California, with its many large aircraft plants, leads the states in the amount of war contracts placed up to Dec. 1, with $10,204,000,000 in commitments, according to the National Industrial Conference Board. Michigan, center of the automotive industry, is second with $9,562,000,000 in contracts while New York is third with $9,158,000,000.

Seventy per cent of the $102,000,000,000 in war contracts placed by the government went to the first 10 states. These include, besides the first three in order Ohio, New Jersey, Pennsylvania, Illinois, Connecticut, Massachusetts and Indiana. Other big war production states are Texas, Missouri, Alabama and Wisconsin.



New Glass to Protect Pilots

The compressed air gun projects dead fowl at speeds up to 300 miles per hour for testing a new bird-proof windshield at one of the plants of E. I. duPont de Nemours & Company.

Acme

Obituary

Edmund T. Allen, 47, director of flight and aerodynamics for the Boeing Airplane Co., was killed Feb. 18 in the crash of a bomber on a test flight at Seattle. He was first test pilot for the National Advisory Committee for aeronautics at Langley Field, Va. He joined Boeing in 1939.

Ernest Coler, 69, one of the pioneers among automotive advertising men, died Feb. 28 at his home in Farmington, Mich. He was advertising manager for Maxwell-Briscoe, Willys-Overland and Briscoe in the early years of the twentieth century. Later he was editor of *Motor Life* and on the editorial staff of *Motor*. Since 1932 he had been publicity director for the Detroit office of Ruthrauff & Ryon, Inc.

Raymond G. Ellis, 57, of the advertising department, The Electric Storage Battery Company, Philadelphia, died Feb. 14. He had been convalescing from an operation when seized with a heart attack.

C. G. Gilbert, 60, manager of the Detroit office of the Federal Products Corporation, died recently at Detroit following a heart attack and short illness. He had been connected with the Federal Products Corporation for twenty-two years.

Stanton Hertz, 48, vice-president and assistant to the president of the Copperweld Steel Company, Glassport, Pa., lost his life in a fire at his home in Pittsburgh, Pa., Feb. 27.

Mason Hulett, 51, of Farrel-Birmingham Company, Inc., Ansonia, Conn., and Buffalo, N. Y., died suddenly Sunday, Feb. 7, in Washington, D. C.

Martin Schiff, 52, chief engineer of the Century Electric Company, St. Louis, died suddenly at his home Feb. 15. He had been with the Century organization since 1933.

John F. Young, 45, superintendent of plant maintenance at the Ford Willow Run bomber plant, died suddenly Feb. 18 at his home in Ann Arbor, Mich.

Fred T. Macrae, Jr., 49, executive vice-president of the White Motor Co. and a leading figure in war production activities, died at St. Luke's Hospital, Cleveland, March 3, following a two-weeks' illness.

THERE'S MORE THAN ONE SHOT IN THE TOOL STEEL MAGAZINE

FOR every machining job, there is a tool steel which will produce optimum results as regards the amount of work done per machine hour and per grind.

Teaming up the right tool steel with the job frequently shows phenomenal improvement. For instance, with a connecting rod broach made of DBL High Speed Steel, a well-known engine builder secured 13,533 pieces for the life of the broach, against a previous best average of 8000 pieces. The increase is almost 70%. A similar company, using 3/8" twist drills made of DBL, secured an average of 30% more holes per grind than with 18-4-1.

War production calls for the best possible performance from every machine tool, new or old. Let our engineers help you to determine the right tool steels to use on your jobs, for improved results. They'll also acquaint you with the best *alternate* steel, for your protection in possible future shortnesses of supply.

WRITE DEPT. AI-2

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STEEL FOR THE NATION'S WELFARE

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STEEL CORPORATION
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CALENDAR

Conventions and Meetings

American Society of Tool Engineers, Milwaukee, Annual Meeting ... March 25-27

Export Managers Club of N. Y., New York City, Annual Meeting...March 30

Midwest Power Conference, Chicago ... April 9 and 10

American Chemical Society, Detroit, Annual Meeting ....April 12-16

American Foundrymen's Association, St. Louis, Annual Meeting..April 28-30

Midwest Safety Conference, 21st Annual Meeting, Chicago..........May 4-6

Elastic Stop Nut Now Called "ESNA"

The locking device manufactured by the Elastic Stop Nut Corporation of America will hereafter be known as the ESNA nut. The trademark was adopted as a result of the practice of engineers in aircraft and other plants using the elastic stop nut to refer to it by initial as the "ESN" nut. Hence, company officers said, in effect the trademark was selected for the company by the customers using the product.

Business in Brief

***Written by the Guaranty Trust Co., New York, Exclusively for* AUTOMOTIVE AND AVIATION INDUSTRIES**

Narrow fluctuations of general business activity continue. The seasonally adjusted index of *The New York Times* for the week ended Feb. 20 rose to 136.2 per cent of the estimated normal from 135.9 for the preceding week, as compared with 133.7 a year ago. The index of *The Journal of Commerce*, without seasonal adjustment, for the same period advanced one fractional point to 128.6 per cent of the 1927-29 average.

Department store sales during the final week of February, as reported by the Federal Reserve Board, were 26 per cent above the corresponding level in 1942. For the period of four weeks then ended, the total was 31 per cent greater than a year ago.

Railway freight loadings during the week ended Feb. 27 totaled 782,855 cars, 4 per cent more than for the preceding week and 0.1 per cent greater than the number a year earlier.

Average daily output of electric power during the same period increased contra-seasonally; total production, however, was 14.2 per cent greater than a year ago, as against a simiiar excess of 15.3 per cent shown for the week before.

Crude oil production in the last week of February averaged 3,873,050 barrels daily, 1250 barrels below the figure for the preceding week and 288,000 barrels less than the average output recommended by the Petroleum Administration for War.

Average daily production of bituminous coal during the week ended Feb. 20 was 2,025,000 tons, as compared with 2,033,000 tons in the week before and 1,822,000 tons a year ago.

Engineering construction contracts awarded in the week ended March 4, totaling $85,809,000, dropped 41 per cent below the corresponding figure in 1942, according to *Engineering News-Record*.

Business failures in the week ended Feb. 25 numbered 111, as compared with 96 in the preceding week and 215 in the corresponding period last year, according to the Dun & Bradstreet report.

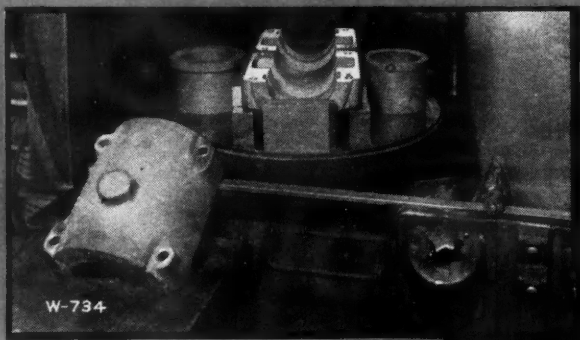
Professor Fisher's index of wholesale commodity prices for the week ended Feb. 26 rose one fractional point to 111.1 per cent of the 1926 average, as against 103.1 a year ago.

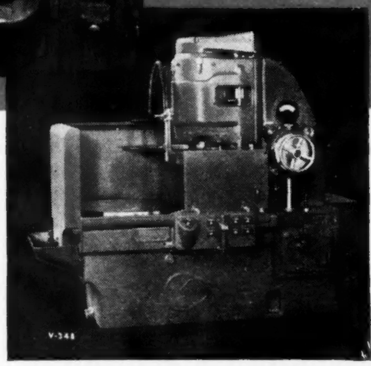
Member bank reserves increased $18,000,000 during the week ended March 3, and estimated excess reserves were unchanged at $1,790,000,000. Business loans of reporting members declined $40,000,000 in the preceding week and stood $1,086,000,000 below the total a year earlier.

Sheffield-Wickman Agreement Ended

The Sheffield Corporation of Dayton, Ohio, and the Wickman Corporation have been operating jointly under an exclusive manufacturing and selling agreement involving certain machine tools. Under this agreement The Sheffield Corporation has redesigned and manufactured these machine tools for the American market. Upon the completion of orders received up to March 14, this joint operation under this agreement is being discontinued by mutual consent.

"PUT IT ON THE BLANCHARD"





Grinding bearing caps on the Blanchard No. 18 Surface Grinder.

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- **Production**
- ★ **Adaptability**
- ★ **Fixture Saving**
- **Operation Saving**
- **Material Saving**
- **Fine Finish**
- ★ **Flatness**
- **Close Limits**

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. . . . . . Especially valuable on jobs like the one illustrated.

THE surfaces on these bearing caps were formerly milled in 34 to 40 minutes each — now they are Blanchard ground at the rate of 7 pieces per hour. The Blanchard No. 18 not only increases production, but decreases setting-up time and eliminates expensive fixtures.

The caps are laid on two parallel bars on the chuck. Smaller steel blocks are laid on top of them and against the caps. Two hollow steel rings against these blocks serve to hold the work sideways. A steel block is placed at each end and the magnetism is turned on.

¼″ of stock is removed from the cast iron bearing caps to limits of +.010″.

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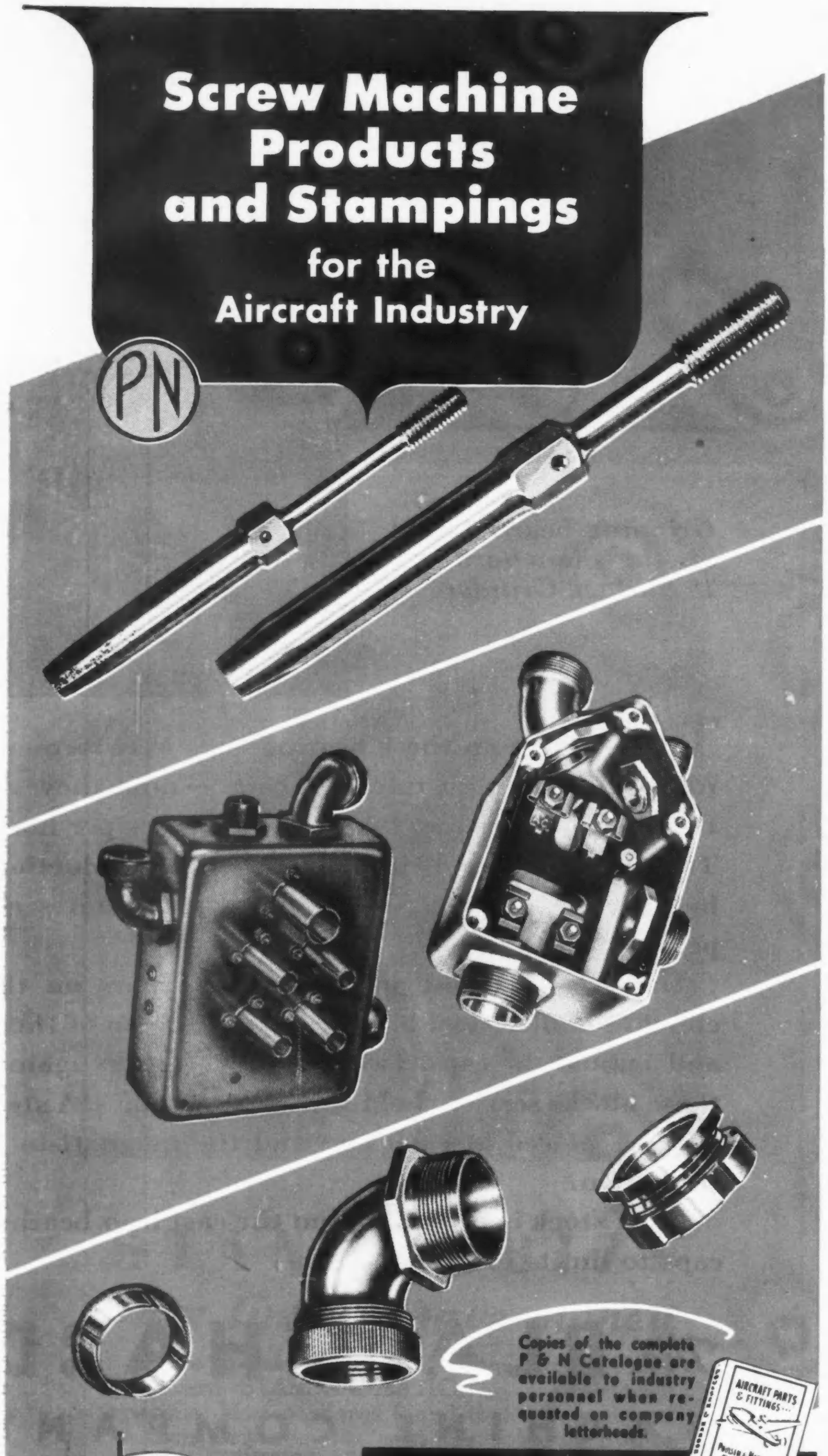
Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



Manpower Becoming Greatest Problem

(*Continued from page 138*)

tal Motors Corp.; W. D. Robinson, vice-president of Briggs Mfg. Co.; I. B. Swegles, vice-president of Hudson Motor Car Co.; H. L. Weckler, vice-president of Chrysler Corp.; Ray Rausch, Ford Motor Co., and Harold Vance, chairman of Studebaker Corp.

The West Coast aircraft wage controversy, pending since last July, finally was brought to a head by a three-hour shutdown at the Seattle and Renton, Wash., plants of Boeing Airplane Co., as workers on the mid-day shift left their jobs at noon to attend a mass meeting called by the Aeronautical Mechanics Union (AFL) to protest failure of the War Labor Board to act on their wage demands. The WLB, which took the case for study Jan. 8, finally approved by a 7-5 vote a general wage increase of 4½ cents an hour for 30,000 Boeing workers and a wage adjustment of $78.75 in cash or $100 in war bonds plus $5.75 in cash in lieu of making the wage raise retroactive to July 6, 1942. The union had asked for a starting wage of 95 cents per hour, comparable to that paid at the Ford Willow Run plant and in the shipbuilding industry, which has taken many workers from aircraft plants. With the new increase, the starting rate is now 67 cents hourly. Paul R. Porter, special representative of the WLB who held hearings on the West Coast last fall, had recommended to the board a 7-cent increase in the basic hourly rate and a starting rate of 65 cents to be raised automatically to 85 cents over a 16-week period.

While handing down the Boeing decision, the WLB also granted a 7½-cent hourly increase that will go to approximately 110,000 employes in eight Southern California airframe companies. A wage adjustment of $64.75 in cash or $75 in war bonds plus $10 in cash also will go to the Southern California workers instead of retroactive wage increases to last July 6. A job classification schedule on the principle of equal pay for equal work also will be instituted in the eight plants to eliminate wage inequalities. There will be 10 major labor grades, with wages ranging from 75 cents to $1.45 per hour, and the total of rated classifications will be reduced from 1154 to 291. Porter in his report had recommended wage increases that would average 6¾ cents per hour.

The dissenting opinion of the five WLB members, Wayne L. Morse, a public representative, and the four labor members, criticized the majority for accepting advice from James F. Byrnes, economic stabilization director, before reaching a decision. Speaking for the minority, Morse said the board should reach its own conclusions without consulting Byrnes, who then has final

power to approve or disapprove any decision on wage raises.

The majority opinion, presented by Chairman W. L. Davis, pointed out the need for uniform pay scales in the industry, where rates sometimes varied from 75 cents to $1.15 per hour for the same type of work in different plants. The majority also rejected a general increase to bring aircraft rates in line with those in the shipbuilding industry, holding that such a move would only lead to a new cycle of wage increases. The aircraft companies have complained about losing employes to the higher paying shipyards.

Organizational work of the UAW-CIO in the aircraft industry is indicated by the report of George F. Addes, secretary-treasurer, for the seven months ending Nov. 30, 1942. The union spent $344,968 for aircraft organizational expense during that period, $134,474 being expended on the East Coast and $60,223 on the West Coast. This investment has brought the union tangible results, including victories in NLRB elections at six New Jersey plants of the Wright Aeronautical Corp., the Wright plant at Lockland, Ohio, and plants of North American Aviation, Inc., at Kansas City and Dallas. The International Association of Machinists (AFL) was the loser at Lockland, Kansas City and Dallas, while the Independent Aircraft Workers of America lost to the UAW-CIO in the Wright New Jersey plants.

Total expenditures of the UAW-CIO for the seven months were $2,131,599, which was $53,034 more than income for the period. Out of each dollar spent, 54.2 cents went for district organizing and servicing expense, 22.7 cents for administrative expense and 23.1 cents for general expense, including the CIO per capita tax and publications. Assets totaled $877,410 as of Nov. 30. Dues-paying members for the seven months averaged 605,894. By February, 1943, total membership had climbed to 845,099.

Addes has recommended the adoption of a 50-cents per month "security assessment" for the duration of the war. This sum would be divided equally between the international and the local unions to be set aside to meet post-war contingencies. As unemployed members do not have to pay the $1 monthly dues, the union wishes to protect itself against post-war unemployment. Two years ago the union officers advocated building up a reserve fund of at least $5,000,000. Following the union's 1942 convention, a referendum was submitted to the members to increase monthly dues from $1 to $1.50. This proposal was defeated rather decisively, 2851 to 1478, based on votes which the locals cast at the 1942 convention.

Apologies and Congratulations

In publishing our review of Aerosphere 1942 in the Feb. 15 issue of AUTOMOTIVE AND AVIATION INDUSTRIES, the name of the author and compiler was, much to our regret, inadvertently omitted. This momentous and extremely useful aeronautical annual was, except for its guest editorials, written and compiled by Glenn D. Angle, who is also to be credited, almost exclusively, with the production of the two previous editions appearing in 1939 and 1941. Our apologies and congratulations are hereby extended to him.

BOOKS . . .

A reference work on mathematics, designed to meet the needs of engineers and students for a condensed source of information on facts and principles, the second edition of the "MATHEMATICS DICTIONARY" is offered by *The Digest Press, Van Nuys, Calif.* This book is edited by Glenn James, asso. Prof. of mathematics, UCLA, assisted by Robert C. James, Cal. Institute of Technology. New features of the revised edition include additional terms, working examples, simplification of definitions, addition of a five-place table of logorithms, and an extension of the integral tables. The editors hope that this reference book may provide a source for the standardization of mathematical terms. It runs some 273 pages with an appendix of 46 pages.

(*Turn to page 230, please*)

MEN . . . . . .

C. J. McCarthy, formerly general manager of the Chance-Vought Aircraft Division has been elected a vice president of United Aircraft Corp., with general supervision over all airplane activities. **Sidney A. Stewart,** general manager of the Hamilton Standard Propeller Division, also has been elected a vice president. **J. Reed Miller,** vice president, has been appointed general manager of the Sikorsky Aircraft Division, with **Joseph M. Barr,** formerly factory manager, as assistant general manager. **Rex B. Beisel,** chief engineer, has been named acting general manager of the Chance-Vought Aircraft Division.

Alexander Kartveli, vice president and chief engineer of Republic Aircraft Corp., has been awarded the honorary degree of doctor of science by Temple University for his work in designing the P-47 fighter plane.

Harry A. Oswald has been appointed labor and industrial relations manager of the Marine Division of Bendix Aviation Corp.

B. R. Sherrell has been named general manager of the Aircraft Division of Willys-Overland Motors, Inc. He has been associated with the aviation industry for 17 years and was formerly with Vultee Aircraft, Inc.

Fred J. Kennedy, Detroit attorney, and **Harold A. Todd** have been elected to the board of directors of Continental Motors Corp., increasing the membership from five to seven.

Vern R. Drum, formerly vice president in charge of manufacturing for Willys-Overland Motors, Inc., has formed his own production engineering firm of Vern R. Drum & Associates, with offices in the New Center Bldg., Detroit. He has previously been associated with Chrysler, Hupmobile and the Ryerson Haynes Co. and more recently was a consultant on manufacturing to the Cleveland Ordnance District.

James D. Kysor, formerly an executive with Campbell-Ewald Co., Inc., Detroit advertising agency, has been named manager of the media and research dept. of Griswold-Eshleman Co., Cleveland agency.

Louis E. Creighton, formerly vice president of the Rotary Electric Steel Co., Detroit, has been appointed head of the new Aircraft Alloy Steel Section of the Steel Division of WPB. This section will help expedite the delivery of certain alloy items to aircraft plants.

Donald E. Gutch, formerly assistant to the factory manager, has been named to the new post of production manager of the Farmingdale (N. Y.) plant of Republic Aviation Corp.

Prof. Francis J. Linsenmeyer has resigned as director of mechanical engineering at the University of Detroit to become factory manager and chief engineer of the National Stamping Co., Detroit.

W. H. Baldwin, manager of credits for the U. S. and Canada, has been elected a vice president of General Motors Acceptance Corp.

Harry D. Smith has been named first vice-president and executive engineer of Globe Hoist Co., with headquarters at Philadelphia.

W. A. Patterson, president of United Air Lines, has been elected to membership on the advisory board of the Institute of Aeronautical Sciences, Inc.

The appintment of **B. H. Quackenbush** as assistant sales manager has been announced by the Foote Bros. Gear & Machine Corp.

J. P. Enright has been appointed abrasive engineer for Indianapolis and vicinity by Norton Co., Worcester, Mass. Robert W. Crawford has been appointed in the same capacity for the Pittsburgh territory, replacing William A. Russell, who is now an ensign in the U. S. Navy.

Detroit Rex Products Co. has announced the following personnel changes. **Ernest N. Taylor** has been advanced to acting manager of the Western Region with headquarters in Chicago. **George Pew** has been promoted from resident engineer in the Eastern Region office at New York City to manager of the Quotation Dept. with headquarters in Detroit.

Copperweld Steel Co. has appointed **F. D. Jones** to the position of assistant advertising manager for the company's Warren, O. div.

Laminated Shim Co., Inc., Glenbrook, Conn., has announced the retirement of **Earl L. Young,** vice-president in charge of production. Mr. Young has been with the company since February, 1920.

(*Turn to page* 188, *please*)

40 YEARS AGO

A novel idea was carried out by the Peugeot firm in France in connection with the recent fuel consumption trials. A public vote was taken through the columns of the *Auto*, in which the automobile public were asked to answer the following questions with regard to the type of vehicle which they would for their own instruction prefer to see engaged in the trials. The average of the replies was as follows: Weight of car—light? 1200 to 1400 pounds. Horse power? 6 to 8 horse power. Speed on level, 24¾ to 29 miles per hour. Speed up Suresnes Hill (3 per cent)? 9¼ miles per hour. Number of passengers? Four. Cost of running per 61.2 miles? 60 cents. Price of car? $1,000. In response to the public request, then, Messers. Peugeot entered three cars complying with these conditions, with the result that one of them secured first honors in their class, "voitures légéres."

From *The Horseless Age*, March 18, 1903.

Accident Prevention in Aircraft Manufacturing

By *Wm. S. Rhodes*

Chief Safety Engineer, Douglas Aircraft Company, Inc., Santa Monica, Calif.

I do not know when we, as safety engineers, have been faced with so many varied and complex problems. We endeavor to maintain good safety records while expanding all over the United States and under terrific production pressure. Along with this, we are having to take women from the kitchens and store counters, we are employing men, many of whom have retired from active work and have never seen modern production machinery much less know anything about running it safely, and convert them into efficient, safety-minded employees. This rapid industrial expansion plus the influx of new employees coupled with the war is drawing heavily on the aircraft industry and has made the job of accident prevention harder to accomplish than ever before.

The following comparison will give you some idea of the size of the women employee problem. In October 1941, there were nineteen hundred productive women employed in aircraft plants, and in July 1942, only nine months later, the number had grown to thirty-nine thousand, nearly a two thousand per cent increase, and by now, at the rate women are being hired, this number has doubled. As best as I have been able to find out, around ninety per cent of these women have never seen any more machinery than a washing machine. Nevertheless, we are making every attempt to keep them from becoming injured. Thus far, we have been rather successful, due probably to the fact that we have held back from putting them on the more hazardous jobs. However, we will have to put women on all operations sooner or later. Many of us are also changing tooling as rapidly as possible to eliminate lifting in excess of twenty-five pounds, since, according to the California State law, this is the maximum load that women are allowed to lift.

The employment of women as punch press operators has focused attention more than ever before on the problem of guarding punch presses, for, even though the punch press is one of the most natural machines for women to operate, we in aircraft have had most of our lost-time accidents on them. I found that, in order for women to operate punch presses safely in our industry, it was not a question of guards, but a question of re-designing our tooling so that the women worker would not have to hold the part in the machine. This is being accomplished by re-designing the tooling so that the material can be placed under the die and both hands can be used in operating a two-handed tripping device to operate the machine.

We are having no end of trouble getting these women to wear safe clothing, leave off their jewelry, and wear proper shoes. These rules are essential for their safety and probably the most discussed at the present time. The California State Industrial Accident Commission has recently published a small book of orders covering this subject entitled "Safety Orders for Women in Industry."

I would like to briefly outline the volunteer safety organization that some of us are using on the Pacific Coast. It consists of a man in each department that, along with his regular duties, is appointed as a safety inspector and is given a safety button and a weekly report book. The book contains a couple of hundred form pages as well as a copy of the safety rules and regulations followed by the company, and is used

by the safety inspector to report unsafe and unsatisfactory conditions in his department. He is required to report weekly on these conditions, being responsible, in his volunteer capacity, to his supervisor or foreman wherein the responsibility of safety rests. The volunteer safety man does much to assist the department head in safety work since in aircraft, as you know, the supervisor or foreman has on the average of 400 men in his department and is kept plenty busy, making it impossible for him to see everything. Regular dinner meetings are given for the volunteer safety inspectors, at which time they are shown a safety picture or two and any other material that may further their safety education. At these meetings, members of the management are present to encourage the inspectors in their work.

Another item that might be of some interest is our departmental safety inspection report that is made on every department at least once a month. You probably are saying that you inspect your departments every day—so do we, but once a month a complete inspection is made by the Plant Safety Inspector and the supervisors or foremen and the volunteer safety inspector go through their departments checking every item on this report. The following items are examined and checked:

Aisle, floors, mats, storage racks, scrap disposal, wrenches, hammers, chisels, hoses, motors, electric cords, jig platforms, air hoses, lights, working area, head clearance, method of handling, stock pileage, equipment used, ladders, ropes, slings, cables and chains, trucks, equipment used in lifting and handling, eye bolts, fire hazards, dust and fumes, chain falls, stairways, panel board areas, crane cables and hooks, eye protection, respirators, gloves, clothing, machine guarding, and unsafe practices. A space is left for recommendations and for the date the inspection was made, the time when the inspection was made, the time required for inspection and the signature and clock number of the employee making the inspection.

When this report is completed, it is checked over and a memorandum and copy of the inspection report are sent back to the supervisor complimenting him on his fine work and at the same time pointing out a few things, if there are any, that he could do to better his department from the standpoint of safety. A copy of the complimentary note is also sent to his boss. This has brought about very satisfactory results and good feeling between the shop and the safety department which, as you know, is essential to the sucess of any safety program. Those are about the only things in safety organization that differ from the average run of organizations which consists of contests, posters, prizes, awards and trophies, educational programs, etc., that we have all read and heard about a number of times.

In order to overcome the possibility of placing an employee applying for employment on a job that would aggravate an existing or arrested condition in the employee's health, many aircraft plants are now giving pre-employment examinations which consist of X-rays, blood tests, etc. We have added to this by requiring all employees operating sanders, grinders, those working in sand blast, around acids and paints, submit to a thorough check every six months. In this check, they are re-X-rayed and examined. We are also running blood counts on those men who work around lead pots, paints, degreasing operations and other operations where solvents are allowed to vaporize and employees may breathe the fumes. This procedure has been very helpful in showing up any harm that may be taking place to the employee's health in those early stages and men can be changed to other work where they usually fully recover.

In aircraft we have trichlorethylene degreasers. When these machines were sold to the different companies, no mention was made of lateral ventilation, but about the only way that concentrations can be kept below 200 parts per million, which has been considered as a safe limit, is to apply lateral ventilation on both sides of the tank. You

should try to maintain 150 lateral feet of air per minute flowing to the slot of the tank. This is a very slow flow and should not draw too heavily upon the supply of fluid. Condensing coils work fine under certain conditions, but do not do the job satisfactorily. Operators of degreaser tanks are rotated at least once a month, giving a man a month on and a month off of the degreasing job. This gives his system time to clear out if he has become exposed by some means or other.

We also have a problem in the anodizing of parts in our anodizing department. Anodizing is an electrolytic process using a solution of dichromate crystals and acid which produces vapors. The vapors cause lung trouble and ulcers in the nasal passages, making it necessary to use lateral ventilation on the tanks. The lateral slot should surround the entire tank just above the fluid level and there should be at least 2,000 linear feet per minute at the slot to insure safe operation.

Paint dipping is another operation which should have lateral ventilation to prevent the operator from breathing aromatic solvents which consist of toluol and xylene. Of course the fumes from these solvents are very harmful to the health of the operator over a prolonged period.

The lead pots, used for dipping control cables, should be well ventilated. Probably the best system for this operation is a suction fan just in the rear of the lead pots. For these, and similar operations, the ventilation should never be from above, but should be arranged so that the fumes are pulled out before reaching the breathing level of the employee.

Dichromate and other pickling operations should have special ventilating systems either using lateral ventilation or removing the fumes from the sides and ends away from the operator.

Our foundries are a little different from other industries inasmuch as we melt lead, zinc, and kirksite—kirksite being a large percentage of zinc and a composition of other metals. These pots should be ventilated, preferably with a cover that can be opened at loading and pouring time and closed at all other times. Covers should also be designed to remove carbon monoxide fumes where gas is used for melting the contents of the pot. Every precaution should be taken to keep these gases and metal fumes out of the workroom area.

Die sanding and grinding also requires special ventilation since the dies that are ground are zinc and kirksite and occasionally the lead portion of the die is sanded. This operation should always be done in a booth that has a slot suction ventilation, or some other method, to pick up the fine grindings. We recently experimented with a new booth that works fine and perhaps I should pass the idea along, for grinding booths have always been a problem. We dug a pit in the floor, lined it with concrete and attached to the pit a duct running outside of the building. The entire unit was then attached to a cyclone which applied suction ventilation to the pit. The top of the pit was closed over by a metal grate and the booth was built on top. This worked very good since particles take the least line of resistance and tend to fall down. With the aid of the down draft caused by the ventilation plus the top of the booth being open, we have found that all particles were picked up and never reach the breathing level of the employee.

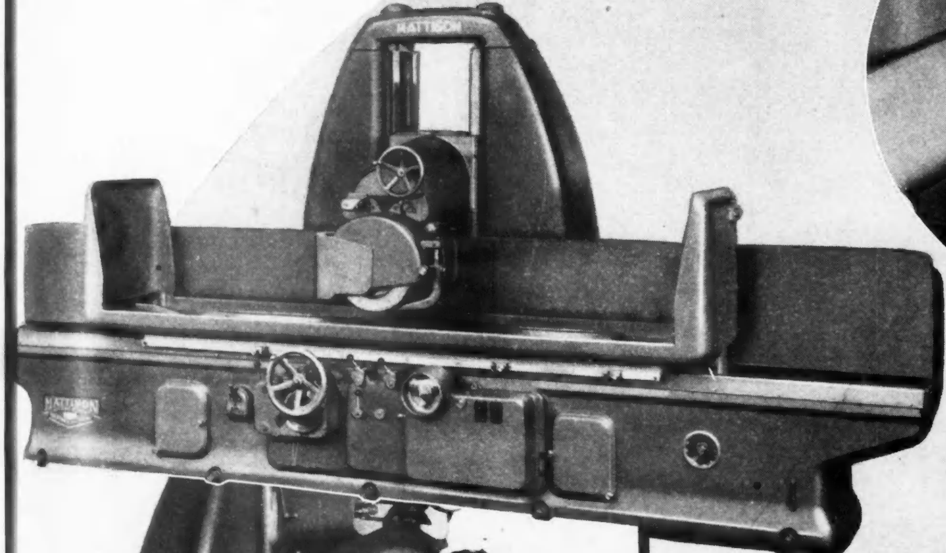
Paint thinner is used quite freely in our industry for washing parts. People doing this job should be given gloves or use hand creams that are not soluble in solvents to prevent the skin from cracking and dermatitis. Carbon tetrachloride is also used for washing purposes, but due to the harmful effect of its fumes and the danger of getting dermatitis from its use, we have practically eliminated it as a washing agent. I would advise that if you are to keep your employees healthy, you discontinue its use entirely, if you have not already done so. Thinners and other solvents have the drawback of being flammable but can be handled safely in safety cans manufactured for this purpose and are less expensive than carbon tetrachloride.

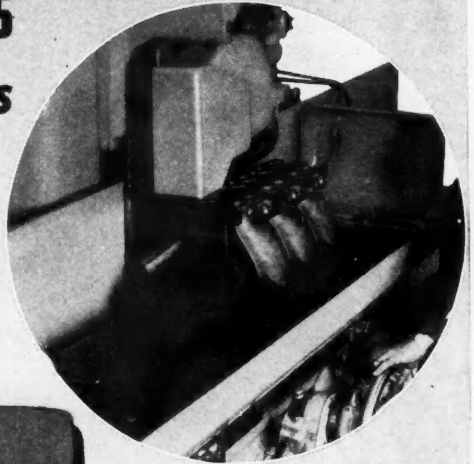
(Turn to page 352, please)

MATTISON SURFACE GRINDERS

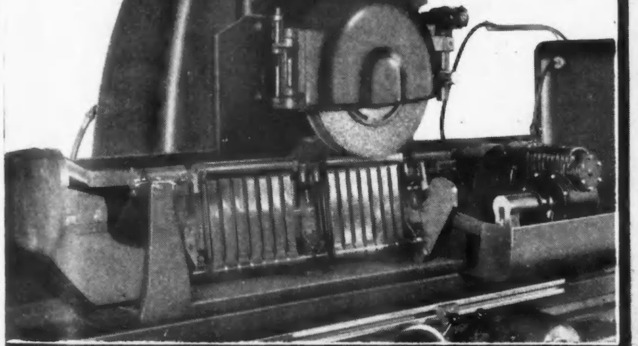
"IN LINE" AT WRIGHT PLANTS

PRECISION WORK on a High Production Basis

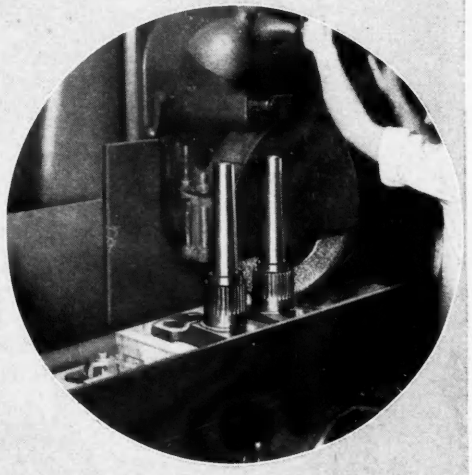




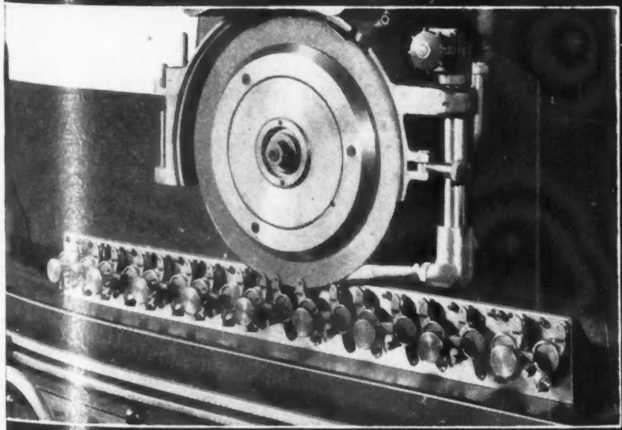
Exhaust manifolds are finish-ground both sides to very close tolerances. Its ability to turn out work to close limits of accuracy at a high production output makes the Mattison Grinder ideal for finishing of aircraft parts.



Mattison Surface Grinder with special fixture for grinding the radius at end of articulated rod. A formed wheel is used with the rods indexed for rough grinding; then the fixture is oscillated by power while the table reciprocates to finish-grind the radius, producing a fine finish and accurate radius.



Grinding face of crank cheeks for counter-weights. 14 cylinder cyclone engine. Held by magnetic chuck. Ground to very close limits. Also form-ground on the radius at the junction of the cheek with the body of the shaft.



Narrow slots in end of rocker arm are ground by Grinder. Special fixture allows holding these parts in accurate alignment while slot is ground. With this arrangement several pieces at a time are accurately ground.

★ ★ ★ ★ ★ ★ ★

Mattison Surface Grinders have proven their value for use in the production of aircraft parts where close precision and high output are required. A few of the factors which account for the success of Mattison Grinders are, the massive double-column support for the wheel-head, high power for rapid stock removal, large table capacity, smooth double-cylinder hydraulic table-drive, simplicity of operation and highly accurate construction. Illustrated are a few typical aircraft applications of the Mattison Grinders at the Wright Aeronautical and Curtiss-Wright Plants.

MATTISON MACHINE WORKS
ROCKFORD, ILLINOIS, U. S. A.

V Awards

THE list following results from a carefully organized and conscientious effort on the part of the editors of AUTOMOTIVE AND AVIATION INDUSTRIES to present a complete compilation of production plants in the United States to which the Army-Navy E Award has been granted since its inauguration late in July, 1942, and up to February 28, 1943.

Prior to the granting of this particular joint award by the Army and the Navy, more than 200 plants had been awarded Navy E flags and a few machine tool plants had been awarded the Army-Navy Star. The list published herewith comprises only plants to which Army-Navy E flags were awarded during the period covered.

A.O.G. Corp., Providence, R. I.
ABBOTT LABORATORIES, New York, N. Y. & North Chicago, Ill.
ABERFOLYE, Inc., Norfolk, Va.
ABOTT FCUORESCENT Co., Inc., New York, N. Y.
ABRASIVE MACHINE TOOL Co., East Providence, R. I.
ABSORBENT COTTON Co. of Am., Valley Park, Mo.
ACCURATE BRASS Co., Inc., Glendale & Long Island, N. Y.
ACME DIE & MACHINE Co., Inc., Latrobe, Pa.
ACME PATERN & TOOL Co., Inc., Dayton, Ohio.
ACUSHNET PROCESS Co., New Bedford, Mass.
ADAMS & WESTLAKE Co., Elkhart, Ind.
ADVANCE PLATING Co., Detroit, Mich.
AERCO Corp., Hollydale, Calif.
AETNA BALL BEARING Mfg. Co., Chicago, Ill.
AETNA-STANDARD ENGINEERING Co., Elwood City, Pa.
AIRCRAFT ACCESSORIES Corp., Burbank, Calif. & Kansas City, Kan.
AIRCRAFT FITTING Co., Cleveland, Ohio.
AIRCRAFT RADIO Corp., Boonton, N. J.
AIRESEARCH Mfg. Co., Los Angeles, Calif.
AIR-TRACK Mfg. Corp., College Park, Md.
ALDON PRODUCTS Co., Duncannon, Pa.
ALLEGHENY LUDLUM Steel Corp., Brackenridge, Pa. & Watervliet, N. Y.
ALLEN Co., CHARLES G., Barre, Mass.
ALLIANCE MACHINE Co., Alliance, Ohio.
ALLIANCE STRUCTURAL Co., Alliance, Ohio.
ALIED CHEMICAL & DYE Corp., Philadelphia, Pa.
ALLIS-CHALMERS Mfg. Co., Tractor Works, Springfield, Ill.
ALTORFER BROTHERS Co., East Peoria, Ill.
ALUMINUM Co. of America, Garwood, N. J. & Niagara Falls, N. Y.
Aluminum Ore Co., Mobile, Ala.
ALUMINUM INDUSTRIES, Inc., Plant No. 1, Cincinnati, Ohio.
AMERICAN BEARING Corp., Indianapolis, Ind.
AMERICAN BRAKE SHOE & Foundry Co., Chicago, Ill.
AMERICAN BRASS Co., Buffalo, N. Y.
AMERICAN CAST IRON PIPE Co., Birmingham, Ala.
AMERICAN CHAIN & CABLE Co., Inc., York, Pa.
AMERICAN CYANAMID Co., Bound Brook, N. J.
AMERICAN LAVA Corp., Chattanooga, Tenn.
AMERICAN LOCOMOTIVE Co., Schenectady, N. Y.
AMERICAN MACHINE & METALS, Inc., East Moline, Ill.
AMERICAN OPTICAL Co., Southbridge, Mass.
AMERICAN RED CROSS Blood Donor Service.
AMERICAN ROLLING MILL Co., Ashland, Ky., Butler, Pa., Hamilton, Ohio, Zanesville, Ohio. Central Works, East Works.
AMERICAN SEATING Co., Grand Rapids, Mich.
AMERIĆAN SHIPBUILDING Co., Lake Erie Plant, Buffalo, N. Y.
AMERICAN SMELTING & REFINING Co., Hayden, Ariz.
AMERICAN STEEL FOUNDRIES, East Chicago, Ill., & Granite City, Ill.
AMERICAN STERILIZER Co., Erie, Pa.
AMERICAN TOOL WORKS Co., Cincinnati, Ohio.
AMERICAN WELDING Co., Carbondale, Pa.
AMERICAN ZINK Co. of Illinois, Monsanto, Ill.
AMES Co., W. R., San Francisco, Calif.
AMES IRON WORKS, Oswego, N. Y.
ANACIN Mfg. Co., Knoxville, Tenn.
ANACONDA COPPER MINING Co., Anaconda, & Great Falls, Mont.
ANDERSON BRASS WORKS, Inc., Birmingham, Ala.

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Awards

(Continued from page 156)

ANDERSON Mfg. Co., ALBERT & J. M., Boston, Mass.
ANDOVER-KENT AVIATION Corp., Middletown, Conn.
ANSONIA Mfg. Co., Ansonia, Conn.
ANTHONY Co., Inc., Streator, Ill.
ARAGON-BALDWIN MILLS, Whitmire, S. C.
ARCOS Corp., Philadelphia, Pa.
ARMSTRONG BROS. TOOL Co., Chicago, Ill.
ARMSTRONG CORK Co., Lancaster, Pa.
ARMY MAP SERVICE, Washington, D. C.
ARO EQUIPMENT Corp., Bryan, Ohio.
ARTER GRINDING MACHINE Co., Worcester, Mass.
ASSOCIATED SPRING Corp., Detroit, Mich.
Wallace Barnes Co., Bristol, Conn.
ATKINSON Co., GUY F., George Pollock Co., Roosevelt Base, San Pedro, Calif.
ATLANTIC Mfg. Co., Philadelphia, Pa.
ATLANTIC PRODUCTS Corp., Trenton, N. J.
ATLAS IMPERIAL DIESEL ENGINE Co., Oakland, Calif.
ATLAS POWDER Co., Weldon Spring, Mo.
ATLAS PRESS Co., Kalamazoo, Mich.
ATWOOD MACHINE Co., Stonington, Conn.
AUSTIN Co., Naval Air Station, Seattle, Wash.
AUTOCAR Co., Ardmore, Pa.
AUTOMATIC MACHINE PRODUCTS Co., Attleboro, Mass.
AUTO ORDNANCE Corp., Bridgeport, Conn.
AUTO SPECIALTIES Mfg. Co., St. Joseph, Mich.
AVIATION Corp., Lycoming Div., Williamsport, Pa.
AXELSON Mfg. Co., Los Angeles, Calif.
B G Corp., New York, N. Y.
BABCOCK & WILCOX Co., Augusta, Ga. & Beaver Falls, Pa.
BADGER & SONS Co., E. B., Point Pleasant, W. Va.
BAKER Bros. Inc., Toledo, O.
BAKEWELL Mfg. Co., Los Angeles, Calif.
BAMBERGER REINTHAL Co., Cleveland, Ohio.
BARBOUR STOCKWELL Co., Cambridge, Mass.
BARIUM REDUCTION Corp., South Charleston, W. Va.
BARNES Co., W. F. & JOHN, Rockford, Ill.
BARRETT & HILP, Mare Island Navy Yard, Mare Island, Calif.
BATTERYLESS TELEPHONE EQUIPMENT Co., Pittsburgh, Pa.
BAUER BROTHERS Co., Springfield, Ohio
BAUSH & LOMB OPTICAL Co., Rochester, N. Y.
BAXTER LABORATORIES, Inc., College Point, N. Y. & Glenview, Ill.
BEAUMONT IRON WORKS, Beaumont, Texas.
BEAUMONT MFG. Co., Spartanburg, S. C.
BEECH AIRCRAFT Corp., Wichita, Kan.
BELDING HEMINWAY Co., Putnam, Conn.
BELL AIRCRAFT Corp., Buffalo, N. Y. & Niagara Falls, N. Y.
BELL & HOWELL Co., Chicago, Ill.
BELL TELEPHONE Laboratories, New York, N. Y.
BELLE KNITTING Corp., Sayre, Pa.
BELLOWS, W. S., and Brown & Root, and Columbia Construction Co., Corpus Christi, Tex.
BELMONT RADIO Corp., Chicago, Ill.
BENDIX AVIATION Corp.
Bendix Radio Div., Baltimore, Md.
Eclipse Machine Div., Elmira Heights, N. Y.
Eclipse-Pioneer Div., Bendix, N. J. & Philadelphia, Pa.
BENSON Mfg. Co., Kansas City, Mo.
BERG BOAT Co., Georgetown, Md.
BETHLEHEM SILK Co., Bethlehem, Pa.
BETHLEHEM STEEL Co., Baltimore, Md., Sparrows Point, Md., Terminal Island, Calif., Shipbuilding Div., San Francisco, Calif.
BICKFORD Co., F. H., Dayton, Ohio.
BISON SHIPBUILDING Corp., North Tonawanda, N. Y.
BLACK & DECKER Mfg. Co., Towson, Md.
BLANCHARD MACHINE Co., Cambridge, Mass.
BLAW-KNOX Co., Union Steel Castings Div., Pittsburgh, Pa.
BLILEY ELECTRIC Co., Erie, Pa.
BLOOMSBURG MILLS, Inc., Bloomsburg, Pa. & Lockhaven, Pa.
BLUERIDGE Co., Inc., Glasgow, Va.
BOEING AIRPLANE Co., Seattle, Wash. & Wichita, Kan.
BONNEY FORGE & TOOL WORKS, Allentown, Pa.
BOONTON MOLDING Co., Boonton, N. J.
BOOTT MILLS, Lowell, Mass.
BOOTZ Mfg. Co., WILLIAM R., Evansville, Ind.
BORG-WARNER Corp. (Two divisions)
BOSTON GEAR WORKS, North Quincy, Mass.
BOUND BROOK OIL-LESS BEARING Co., Bound Brook, N. J.
BOWSER & Co., Inc., S. F., Fort Wayne, Ind.
BOYT HARNESS Co., Des Moines, Iowa
BRANN & STUART, Inc., Mechanicsburg, Pa.
BRECON LOADING Co., Coosa River Ordnance Plant, Talladega, Ala.
BREWSTER Co., Inc., Shreveport, La.
BRIDGEPORT BRASS Co., Bridgeport, Conn.
BRIDGEPORT FABRICS, Inc., Hollis Ave. Plant & Wood Ave. Plant, Bridgeport, Conn.
BRIGGS Mfg. Co., Detroit, Mich.

(Turn to page 160, please)

Tools that meet the need for *SPEED!*

In no other industry does *tool efficiency* count so heavily as in aviation. On countless thousands of operations in production, assembly and maintenance the *right* tools . . . *the fastest tools* . . . permit and encourage higher output and greater precision from every worker.

Snap-on tools squarely meet aviation's need for speed . . . *and more speed.* They help turn out more work and *better work.* They are used and endorsed by every major airline in America. In famed engine and parts plants . . . along the industry's greatest production lines . . . at maintenance and overhaul bases everywhere . . . their flexibility and swift application, solid grip and powerful leverage, are saving priceless seconds, minutes, hours!

The 3,000 tools in the Snap-on line, and Snap-on's direct-to-you service, are conveniently available through 35 factory branches located at key air centers throughout the United States and Canada. Write for catalog and address of the nearest branch.

SNAP-ON TOOLS CORPORATION

8054-C 28th Avenue Kenosha, Wisconsin

Awards

(*Continued from page 158*)

BRIGGS & STRATTON Corp., West Plant, Milwaukee, Wisc.
BROAD BROOK Co., Broad Brook, Conn.
BROOKSIDE MILLS, Knoxville, Tenn.
BROWN & ROOT, W. S. Bellows, Columbia Construction Co., Naval Air Station, Corpus Christi, Tex.
BROWN SHIPBUILDING Co., Houston, Tex.
BRUNNER Mfg. Co., Utica, N. Y.
BRYANT CHUCKING Grinder Co., Springfield, Vt.
BRYANT HEATER Co., London Road Plant, Cleveland, Ohio.
BUCYRUS ERIE Vo., South Milwaukee, Wis.
BUDD, Edward G., Co., Philadelphia
BUDD WHEEL Co., Detroit, Mich.
BUFFALO FORGE Co., Buffalo, N. Y.
BUFFALO PUMPS, Inc., North Tonawanda, N. Y.
BUILDERS IRON FOUNDRY, Providence, R. I.
BULLARD Co., Bridgeport, Conn.
BURGESS-NORTON Mfg. Co., Geneva, Ill.
BURROUGHS WELLCOME & Co. (U.S.A.) Inc., Tuckahoe, N. Y.
BUTLER Mfg. Co., Kansas City, Mo.
BYRNE ORGANIZATION, Solomons, Md.
BYRON JACKSON Co., Los Angeles, Calif.
CAMBRIDGE SCREW Co., Cambridge, Mass.
CAMDEN FORGE Co., Camden, N. J.
CANISTER Co., Phillipsburg, N. J.
CARBIDE & CARBON Chemicals Corp., Charleston, W. Va.
CARLTON MACHINE TOOL Co., Cincinnati, Ohio.
CAROLINA ALUMINUM Co., and Aluminum Co. of America, Badin, N. C.
CATERPILLAR TRACTOR Co., East Peoria, Ill.
CAULDWELL-WINGATE Co., Proirier & McLane Corp., Orangeburg, N. Y.
CENTURY MACHINE Co., Cincinnati, Ohio.
CESSNO AIRCRAFT Co., Wichita, Kan.
CHAIN BELT Co., Milwaukee, Wisc.
CHAMPION PANTS Mfg. Co., Inc. (Royal Pants Co.), Perkasie, Pa.
CHAPMAN VALVE Mfg. Co., Indian Orchard, Mass.
CHASE BRASS & COPPER Co. (four units), Waterbury, Conn.
CHATHAM Mfg. Co., Elkin, N. C.
CHEMURGIC Corp., Richmond, Calif.
CHENEY BROTHERS, Manchester, Conn.
CHICAGO BRIDGE & IRON Co., Eureka, Calif.
CHICAGO-LATROBE TWIST DRILL WORKS, Chicago, Ill.
CHICAGO PNEUMATIC TOOL Co., Cleveland, Ohio.
CHROMIUB CORP. of America, Chicago, Ill. & Waterbury, Conn.
CHRYSLER Corp., Detrojt, Mich.,
Airtemp Div., Dayton, Ohio,
Detroit Tank Arsenal, Centerline, Mich.
CIBA PHARMACEUTICAL Products, Inc. Summit, N. J.
CINAUDAGRAPH Corp., Stamford, Conn.
CINCINNATI BICKFORD TOOL Co., Cincinnati, Ohio.
CINCINNATI MILLING & GRINDING MACHINE Co., Cincinnati, Ohio.
CINE SIMPLEX Corp., Syracuse, N. Y.
CITIES SERVICE DEFENSE Corp., Maumelle Ordnance Plant, Little Rock, Ark.
CLARK BROTHERS Co., Olean, N. Y.
CLARK EQUIPMENT Co., Battle Creek, Mich.
CLAROSTAT Mfg. Co., Inc., Brooklyn, N. Y.
CLAYTON Mfg. Co., Los Angeles, Calif.
CLEEREMAN MACHINE TOOL Co., Green Bay, Wisc.
CLEVELAND AUTOMATIC MACHINE Co., Cleveland, Ohio.
CLIMAX MOLYBDENUM Co., Climax, Colo., Detroit, Mich., Langeloth, Pa.
CLINTON WOOLEN Mfg. Co., Clinton, Mich.
CLYDE IRON WORKS, Inc., Duluth, Minn.
COCHECO WOOLEN Mfg. Co., East Rochester, N. H.
COCHRAN FOIL Co., Louisville, Ky.
COLLINS RADIO Co., Cedar Rapids, Iowa.
COLONIAL RADIO Co., Buffalo, N. Y.
COLORADO FUEL & Iron Corp., Pueblo, Colo.
COLT'S PATENT FIRE ARMS Mfg. Co., three plants in Hartford, Conn.
COLUMBIA CONSTRUCTION Co., and W. S. Bellows and Brown & Root, Corpus Christi, Tex.
COLUMBIA STEEL Co., Pittsburg, Calif.
COLUMBIA STEEL & Co., Carnegie, Pa.
COLUMBIAN STEEL TANK Co., Kansas City, Mo.
COLUMBIANA BOILER Co., Columbiana, Ohio.
COMBUSTION ENGINEERING Co., Inc. Chattanooga, Tenn.
COMMERCIAL SHEARING & STAMPING Co., Youngstown, Ohio.
CONE AUTOMATIC MACHINE Co., Inc. Windsor, Vt.
CONGOLEUM-NAIRN, Inc., Kearney, N. J.
CONNECTICUT TELEPHONE & ELECTRIC CORP., Meriden, Conn.
CONSOLIDATED AIRCRAFT Corp., Plants 1 and 2, San Diego, Calif.
CONSOLIDATED STEEL Corp., Ltd. Orange, Tex.
CONTINENTAL MOTORS Corp., Detroit, Mich.; Muskegon, Mich.
CONTINENTAL ROLL & STEEL FOUNDRY, Coraopolis, Pa. & East Chicago, Ind.
CONTINENTAL RUBBER WORKS, Erie, Pa.
CONTRACTORS, Pacific Air Bases, Pearl Harbor, T. H.

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Army-Navy "E" Awards

(Continued from page 160)

CONVERSE HENCE, Inc., Plants 1 and 2, Greenville, S. C.
CONVERSE RUBBER Co., Malden, Mass.
COOK PAINT & VARNISH CO., North Kansas City, Mo.
COPCO STEEL & ENGINEERING Co., Detroit, Mich.
CORBIN SCREW Corp., New Britain, Conn.
CORNING GLASS WORKS, Corning, N. Y.
COUSE LABORATORIES, Inc., Newark, N. J.
COWEN-NORTEN Construction Co., and Harmon Construction Co., and Tankersley Construction Co., Norman, Okla.
COX CONSTRUCTION Co., Inc., and P. T., & Spearin, and Preston & Burroughs, Newport, R. I.
CRAMERTON MILLS, Cramerton, N. C.
CRAMP BRASS & Iron Foundry, Eddystone, Pa.
CRANE CO., Chicago, Ill.
CRAWFORD-AUSTIN Mfg. Co., Waco, Tex.
CRAWFORD MFG. Co., Richmond, Va.
CRESCENT TRUCK Co., Lebanon, Pa.
CROMPTON & KNOWLES Loom Works, Worcester, Mass.
CROUSE-HINDS Co., Syracuse, N. Y.
CROWLEY & Co., H. L., West Orange, N. J.
CUMMINGS MACHINE Works, Boston, Mass.
CUMMINS ENGINE Co., Columbus, Ind.
CUNNINGHAM SON & Co., James, Rochester, N. Y.
CURTISS-WRIGHT Corp., Airplane Div., Plants 1 and 2, Buffalo, N. Y.
CUSHMAN CHUCK Co., Hartford, Conn.
CUTLER-HAMMER, Inc., Five plants in Milwaukee, Wis.
DAMASCUS STEEL Products Corp., Rockford, Ill.
DARBY PRODUCTS of Steel Plate Corp., Kansas City, Kan.
DAVIS & GECK, Inc., Brooklyn, N. Y.
DAYTONA BEACH Boat Works, Inc., Daytona Beach, Fla.
DE JUR AMSCO Corp., Shelton, Conn.
DELTA MFG. Co., Milwaukee, Wis.
DE ROSSI & Son Co., Vineland, N. J.
DETROIT BROACH Co., Inc., Detroit, Mich.
DE VILBISS Co., Toledo, Ohio
DEXTER FOLDER Co., Pearl River, N. Y.
DIAMOND T MOTOR CAR Co., Chicago, Ill.
DICTAPHONE Corp., Bridgeport, Conn.
DIEBOLD SAFE & Lock Co., Canton, Ohio
DISSTON & SONS, Inc., Henry, Philadelphia, Pa.
DIVINE BROS., Utica, N. Y.
DOLOMITE PRODUCTS Co., Barge Plant, Gates, N. Y.
DOUGLAS AIRCRAFT Co., El Segundo, Calif.
DOW CHEMICAL Co., (Two plants)
DOYLE & RUSSELL, Norfolk, Va.
DUNN CONSTRUCTION Co., & Polk Smartt Paving Co., Millington, Tenn.
DUPLEX PRINTING Press Co., Battle Creek, Mich.
DU PONT DE NEMOURS & Co., Inc., E. I., Belle, W. Va., Deepwater Point, N. J., Charleston, W. Va., Barksdale, Wisc., Martinsville, Va., Niagara Falls, N. Y., Carneys Point, N. J., Pompton, N. Y., Carneys Point, N. J., Pompton Lakes, N. J.
Alabama Ordnance Works, Sylacauga, Ala.
Chickasaw Ordnance Works, Millington, Tenn.
Electro Chemicals Plant, Niagara Falls, N. Y.
Indiana Ordnance Works, Charlestown, Ind.
Kankakee Ordnance Works, Joliet, Ill.
Neoprene Plant, Deepwater, N. J.
Nylon Laboratory, Wilmington, Del.
Repauno Works, Gibbstown, N. J.
EAGAN Co., Walter H., Philadelphia, Pa.
EASTMAN KODAK Co., Rochester, N. Y.
EATON MFG. Co., Detroit, Mich.
EATON METAL Products Corp., A. N., Omaha, Neb.
ECLIPSE COUNTERBORE Co., Detroit, Mich.
EDGEWATER STEEL Co., Oakmont, Pa.
EDGEWOOD CHEMICAL Warfare Arsenal, Edgewood, Md.
EDISON-SPLITDORF Corp., West Orange, N. J.
EDO AIRCRAFT Corp., College Pt., N. Y.
EDWARDS & Co., Norwalk, Conn.
EHRHARDT TOOL & Machine Co., St. Louis, Mo.
EISENDRATH Co., Joseph N., Marinette, Wis.
ELECTRIC AUTO-LITE Co., Sarnia, Ontario & Toledo, Ohio.
ELECTRIC BOAT Co., Elco Naval Div., Bayonne, N. J.
ELECTRIC PRODUCTS Co., Cleveland, Ohio.
ELECTRIC SPECIALTY Co., Stamford, Conn.
ELECTRIC TACHOMETER Corp., Philadelphia, Pa.
ELECTRIC VACUUM CLEANER Co., Inc., East Cleveland, O.
ELECTRO-METALLURGICAL Co., Niagara Falls, N. Y.
ELECTROMASTER, Inc., Detroit, Mich.
ELECTRONIC LABORATORIES, Inc., Indianapolis, Ind.
ELLIOTT Co., Jeannette, Pa. & Ridgway, Pa.
ELLIS MILLS, Inc., A. D., Monson, Mass.
EMERSON ELECTRIC Mfg. Co., Turret Div., St. Louis County, Mo., Booster Plant, St. Louis, Mo.

(Turn to page 208, please)

One Virtue IN COMMON

Whether your choice be Bulldog, Setter, Spaniel, Airedale, Dane, Terrier or St. Bernard, yours shares one of his best qualities with the rest. You can depend on him to do at your bidding that for which he was bred and trained.

Remember that, also, as characteristic of **PUSH-PULL CONTROLS.** They may be designed of different dimensions and for different purposes—for the remote control mechanisms such as brakes, gear shifts and blades of tractor-operated scrapers, shovels and cranes. They provide vital, remote control for much American fighting equipment.

All of these **PUSH-PULL CONTROLS** provide positive control. Operation is easy because the moving part operates in an hermetically sealed bath of lubricant. They are all rattle-free. But, above all, each can be depended upon to do the job for which it was designed and built.

Remember that. Glad to work with you to develop **PUSH-PULL CONTROLS** to fit your planned peace-time production.

PUSH-PULL AUTOMOTIVE CONTROLS

AUTOMOTIVE AND AIRCRAFT DIVISION

6-235 General Motors Building, Detroit • 695 Bryant Street, San Francisco

ACCO TRADE MARK

AMERICAN CHAIN & CABLE COMPANY, Inc.

BRIDGEPORT • CONNECTICUT

Production Speeding Literature

Books, booklets, brochures, data sheets, etc., that offer authoritative aid in the doing of more, faster with less

MATERIALS, Metallic

RYERSON & SON, INC., JOSEPH T., Chicago, Ill.
Book: Steel Data Book.
Catalogs: National Emergency Steels—Facts and Figures for Practical Use; Machinery and Tools.
Stock lists: Steels—Certified Quality.

BLISS & LAUGHLIN, INC., Buffalo, N. Y.
Book: Cold Finished Bar Steels—Production Methods, Technical Data, Steel. Data, Tables ($2.00).
Weight Calculator Chart.
Folders: Alloy Steels; Speed Ultra-Cut Screw Stock; Ground Shafting; Cold Finished Steel Shafting.

CARPENTER STEEL CO., Reading, Pa.
Book: A Handbook of Modern Practice for Toolmakers. ($1.00 in U. S.)
Slide Rule: The A.B.C. of Stainless Steel.
Manuals: Matched Tool Steel; Selection, Engineering, Fabrication.
Guide Chart: Spark Testing Tool Steels.

DRIVER-HARRIS CO., Harrison, N. Y.
Data Book on Electrical Heat and Corrosion Resisting Alloys.
Booklets: Radio Alloys; Nichrome Chromax Cimet.

ALLEGHENY LUDLUM STEEL CORP., Pittsburgh, Pa.
Handbook: Special Steels, Their Properties and Uses.
Booklets: Tool Steels—An Elementary Discussion: Pluramelt—describing the Pluramelting or cladding process used on Allegheny composite stainless product—fabrication information.

INDIUM CORP. OF AMERICA, Utica, N. Y.
Folders: What Indium Can Do For You; Bearings and Bearing Corrosion; Indium.

SAGINAW MALLEABLE IRON DIV., General Motors Corp., Saginaw, Mich.
Catalog: Arma Steel—Applications to Diesel Engines, Arms and Armament.

REPUBLIC STEEL CORP., Cleveland, O.
Booklet: National Emergency Steels—properties, treatment, application.

RUSTLESS IRON AND STEEL CORP., Baltimore, Md.
Booklet: Shop Notes on the Machining of Stainless Steel.
Handbook: Rustless Stainless Steels—technical information on the physical properties of stainless steel.

MATERIALS, Non-Metallic

TECHNICAL PLY-WOODS, Chicago, Ill.
Data Book: Plywoods—Tables, Suggestions, Applications, Properties.

DUREZ PLASTICS & CHEMICALS, INC., North Tonawanda, N. Y.
Folders: The New Resin Bonded Plywood; Durez Plastics—Applications.

MONSANTO CHEMICAL CO., Plastics Div., St. Louis, Mo.
Catalogs: Lustron—A Monsanto Plastic; Resinox: A Wartime Guide to Monsanto Plastics.

GOODRICH, CO., B. F., Akron, O.
Booklets: Examples of Goodrich Development in Rubber; Rubber for Victory; Guide Book for War Industries.
Catalogs: Section No. 9000—Vulcalock Products; No. 7020—Industrial Molded Rubber Goods.

HERCULES POWDER CO., Inc., Wilmington, Del.
Booklets: Truline Binder; Terpene Solvents: Ethyl Cellulose; Flexalyn; Cellulose Acetate; all giving data, tables, etc.

ROHM & HAAS CO., Philadelphia, Pa.
Booklets: Technical Data on Plexiglas-Optical; Properties of Plexiglas; Plexiglas Method of Installation; Plexiglas Fabricating Manual.

ACADIA SYNTHETIC PRODUCTS, DIV., Western Felt Works, Chicago, Ill.
Technical Data Book; Saran Plastic, Pipes, Sheets, Tubing and Fittings.

BAKELITE CORP., Unit Union Carbide and Carbon Corp., New York City, N. Y.
Folders: The Story of Elastic Vinyl; The Story of Vinylite Plastics.
Booklet: Bakelite Molding Plastics; A simplified Guide to Bakelite Plastics; Laminating Plastics; Vinylite Resins, Their Forms, Properties and Uses; Rigid Sheet Plastics; Polyvinyl Acetate Resins.

BIBB MFG. CO., Macon, Ga.
Booklets: Story of Cotton—Processes; Enlisted for the Victory—War Material.
Folders: Kinks in Twine—Tables, A Long Yarn in Few Words—Cord Data.

RESISTOFLEX CORP., Belleville, N. J.
Catalogs: Characteristics of Resistoflex PVA, a flexible, synthetic resin compound for application in Aviation and Automotive Industries.

MILLS, CORP., ELMER E., Chicago, Ill.

(Turn to next page, please)

Catalog: Injection Molded Plastics—Applications, Comparison Chart.
UNITED STATES RUBBER CO., Rockefeller Center, New York City.
Booklet: Synthetic Rubber—Development, Comparative Properties, Types, Tables.
ARMSTRONG CORK CO., Lancaster, Pa.
Booklet: How to Eliminate Noise Demons.
Folder: Low Cost Walls of Temlok de Luxe.
duPONT deNEMOURS, & CO., E. I., Plastic Div., Arlington, N. J.
Manual: Lucite Methyl Methacrylate Resin.
Booklet: Engineering Highlights About duPont Plastics.
UNITED STATES PLYWOOD CORP., New York, N. Y.

Production Speeding Literature

(Continued from the preceding page)

Booklets: Weldwood — The Modern Material of Infinite Applications; Waterproof Weldwood for Aviation.
Bulletin: Weldwood Plastic Resin Waterproof Glue.
AMERICAN FELT CO., Glenville, Conn.
Chart: How Felt is Made.

CASTING

AMERICAN MANGANESE STEEL DIV., American Brake Shoe & Foundry Co., Chicago Heights, Ill.
Booklets: Ahsco Alloy Castings for In-dustrial Applications.
HARVILLE AIRCRAFT DIE CUTTING CORP., Los Angeles, Cal.
Manual: Engineering Design for Die Casting.
Folders: Engineering Aspects of Pressure Molding; Characteristics of Harvill Aluminum Die Castings.
BAKELITE CORP., Unit Union Carbide and Carbon Corp., New York, N. Y.
Folder: Bakelite Sealing Solutions for Porous Castings.
BELLE CITY MALLEABLE IRON CO., Racine, Wis.
Booklet: Descriptive of malleable casting processes and physical charistics of Electromal, Belmalloy and Belectric Iron No. 2.

FORGING, STAMPING & PUNCHING

HYDRAULIC PRESS MFG. CO., Mount Gilead, O.
Bulletins: 4207—Presses for Process Industries; 4206 — Fastraverse Metal Working Presses; 35—The Hydraulic Press.
DAYTON ROGERS MFG. CO., Minneapolis, Minn.
Service Manual: Installation Instructions and Service Manual for Pneumatic Die Cushions.
Booklet: Metal Stamping in Small Lots
PETTINGELL MACHINE CO., Amesbury Mass.
Catalog Sheets: Motorized Hammers Motorized Hammer with Built-In Motor.
WHISTLER & SONS, Inc., S. B., Buffalo N. Y.
Catalog: Dies, Tools and Special Machinery—Advantages of standard adjustable punch and die units.
AJAX MFG. CO., Cleveland, O.
Bulletins: Forging Presses; Air Clutches; Double Draft Ventillated Air Clutch; Wide Adjustment Forging Rolls.
CHAMBERSBURG ENGINEERING CO., Chambersburg, Pa.
Bulletins: 211-G, Double Frame Hammers; No. 1275, Pneumatic Forging Hammer—Motor Driven; 208-A, Steam Side Presses; 211-F, single Frame Hammers; 255-A, Model "E" Steam Drop Hammers; 276, Cecostamping and the Chambersburg Cecostamp.
Maintenance Bulletin: Steam Drop Hammer Model "E".
BLISS CO., E. W., Brooklyn, N. Y.
Booklet: High-Production Presses—Specifications, Applications, Tables
MASONITE CORP., Chicago, Ill.
Folders: Masonite Die Stock; Low Cost Dies for Aircraft Parts—Applications Technical Data.
L & J PRESS CORP., Elkhart, Ill.
Folder: Open Back Inclinable Presses—Inclinable Power Punch Presses.
LANSING STAMPING CO., Lansing, Mich
Booklet: Take a Two Minute Trip—Descriptive of pressed metal and stamping facilities.
TECHTMANN INDUSTRIES, INC., Milwaukee, Wis.
Bulletins: Pollasky Automatic Spacer for economizing punch press production; Speed-grip Automatic Adjustable Wrench; Doughboy Rotary Bag Sealer; Pack-Rite E-Z Sealers; Pack-Rite Senior Krimper; Alpert Long-Nose Cutter-Retriever; Skilbeck E-Humidifier.
INTERSATE DROP FORGE CO., Milwaukee, Wis.
Manual: Revised Steel Specifications Including National Emergency Steel Specifications, Suggested Substitution of National Emergency Steels.
Chart: Chemical Analysis and Machinability Rating.

MACHINING (Machine Tools)

KINGSBURY MACHINE TOOL CORP., Keene, N. H.
Bulletin 5-40: Kingsbury 12" and Fleximatics Models 119 and 128.
LANDIS TOOL CO., Waynesboro, Pa.
Book: Better Grinding.
ALUMINUM CO. OF AMERICA, Pittsburgh, Pa.
Booklet: Machining Alcoa Aluminum
GENERAL ELECTRIC CO., Schenectady N. Y.

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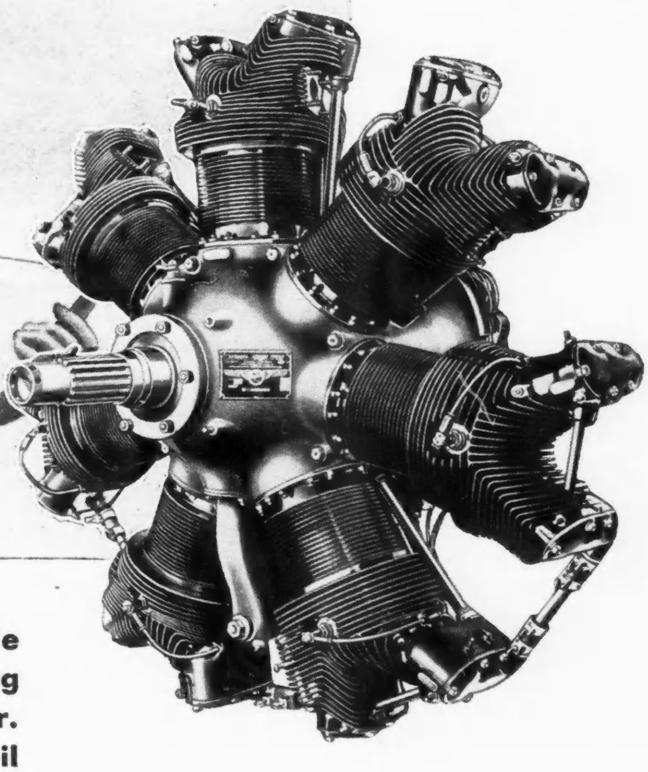
ARMY E NAVY

Your Dollars are Power, too! Buy War Bonds



THE mighty power of dependable Continental Red Seal Engines is serving our fighters on land, sea, and in the air. It is also serving for industry, in the oil fields, and on our farms — serving to keep alight the inspiration and unconquerable "Power to Win" of American Liberty.

Continental Motors · Powerful as the Nation · America's Standard

Continental Motors Corporation

Aircraft Engine Division

Production Speeding Literature

(Continued from page 174)

Pamphlet: Safety Regulations for Drill-Press Operators.

GEAR GRINDING MACHINE CO., Detroit, Mich.
Catalog: Specifications and illustrations of internal and external gear grinding equipment.

MATTISON MACHINE WORKS, Rockford, Ill.
Catalog: Mattison High-Powered Precision Surface Grinder Set-Ups—Examples of Work.

ILLINOIS TOOL WORKS, Chicago, Ill.
Booklet: Hob Sharpening—The Right and Wrong Way.

LEES-BRADNER CO., Cleveland, O.
Catalog No. 52; Thread Milling Machine Model CT.
Circular No. 50: Thirty Years of Pioneering.
Folders: Model L-T Thread Miller; Model H T Heavy Type Thread Miller.

GENESEE TOOL CO., Fenton, Mich.
Booklet: Genesee Special Cutting Tools—Turning Tools, Forming Tools, Reamers and Counterbores, Carbide Tools, Milling Cutters.

LIPE-ROLLWAY CORP., Syracuse, N. Y.
Booklets: Lathes—Chamfering Machines and Pneumatic Feeds.

MALL TOOL CO., Chicago, Ill.
Booklets: The Care and Maintenance of the Mall Saw; Instructions for Operating and Maintaining Mall Surface Planes.

BAKELITE CORP., Unit Union Carbide and Carbon Corp., New York, N. Y.
Booklets: High Speed Abrasive Wheels; Fabrication of Vinylite Plastics by Screw Extrusion.

COLONIAL BROACH CO., Detroit, Mich.
Booklet: Answers on Broaching by Colonial.
Folder: Universal Horizontal Broaching Machines.

DeSANNO & SONS, A. P., Phoenixville, Pa.
Booklets: Radiac Grinding Wheels; Facts About Por-Os-Way; Grinding Wheel Specifications for Grinding Machines; Radiac Mounted Points and Mounted Wheels.

FRAY MACHINE TOOL CO., Glendale, Cal.
Folders: Fray Ram Type No. 7-B Milling Machines; Fray Ram Type No. 9 Milling Machines; Micrometer Offset Boring Head.

MICHIGAN TOOL CO., Detroit, Mich.
Bulletins: No. 149-A—On Hobbing; No. GF-40—For Better Gears; No. GS-42 Gear Shaping and Shaper Cutters.

NORTON CO., Worcester, Mass.
Handbook: Tool Room Grinding.
Folder: The "Know-How" of Grinding.
Booklets: Special Devices and Mechanisms for Standard Norton Machines; Grinding, Lapping and Superfinishing Machines; What, Why and How—Essential Facts About Grindings; How To Increase Tool Life; Grinding Wheels for the Tool Room; Thread Grinding; How to Use Truing and Dressing Tools for Better Grinding; Disc Grinding; Grinding "Haynes Stellite" J-Metal and "2400" Cutting Tools; Abrasive and Grinding Wheels (handbook for grinding apprentices); O. D. Grinding; Grinding Carbide Tipped Tools; Norton Cut-Off Wheels; A Primer on Grinding Wheel Safety.

PETTINGELL MACHINE CO., Amesbury, Mass.
Catalog Sheets: Trimming Cutters; Heavy Duty Electric Cutters; Electric Rotary Cutters.

TAFT-PEIRCE MFG. CO., Woonsocket, R. I.
Booklets: Air Service and Production Equipment; Back Spot Facing Machines; 6" Rotary Surface Grinder; T-P No. 1 Precision Surface Grinder.

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa.
Booklet: Wartime Conservation (Recommendations for effecting immediate savings of critical materials in the selection, application and use of Westinghouse equipment).

GLEASON WORKS, Rochester, N. Y.
Catalog: Gleason Straight Bevel Gear System ($2.50).
Reprints: Gears and Gear Cutting; Bevel Gears in Aircraft.

MICROMATIC HONE CORP., Detroit, Mich.
Booklets: Fundamental Principles Used in the Honing Process; Micromatic Microhoning Generates Combined Results in One Process.

STERLING GRINDING WHEEL DIV. The Cleveland Quarries Co., Tiffin, O.
Folders: Centerless Grinding; Cylindrical Grinding; Tool Room Grinding.

GREEN FIELD TAP & DIE CORP., Greenfield, Mass.
Handbook: Facts About Taps and Tapping.
Booklet: How to Get More Production from Taps.
Folders: Tap Talk; How to Sharpen Taps.

BARNES CO., W. F. AND JOHN, Rockford, Ill.
Circular: 445 Deep Hole Drilling and Boring Machine.

VASCOLOY-RAMET CORP., North Chicago, Ill.
Wall Chart: 4 Simple Ways to Get Longer Life from Your Cemented Carbide Tools.

CARBOLOY CO., Inc., Detroit, Mich.
Booklet: GT 128—Instructions for Using Carboloy Standard Tools.
Bulletins: GT-127—Grinding Cemented Carbide Milling Cutters and End-Cutting Tools; GT-133—Carboloy Tool Manual.

SOUTHERN ENGINEERING CO., INC., Los Angeles, Cal.
Manual of Operation for the Southern Engineering Metal Forming Machine

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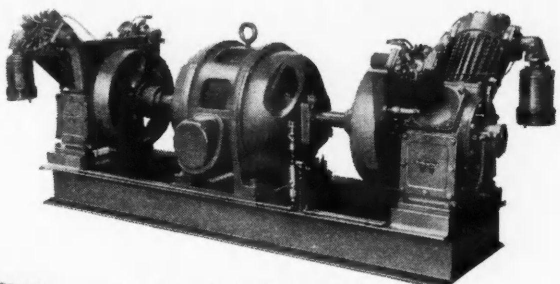
WORTHINGTON Vertical COMPRESSORS



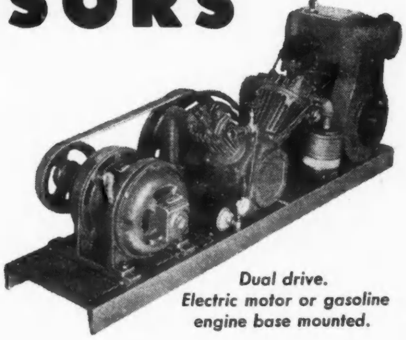
Twin unit with double-end shaft motor on steel base

24 Sizes

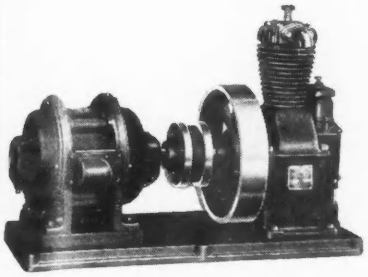
344 Arrangements

Capacities to 164 c.f.m.

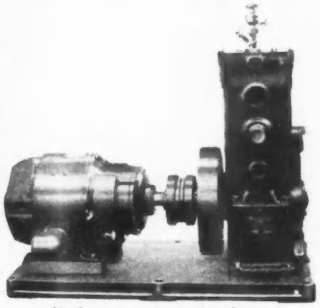
Pressures to 1000 lbs.



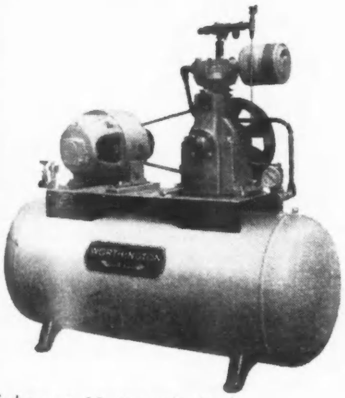
Dual drive. Electric motor or gasoline engine base mounted.



Unit direct connected to electric motor



High-pressure unit direct connected to electric motor



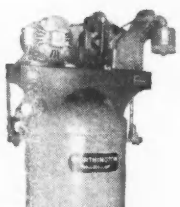
Tank-mounted belted unit showing pressure regulator control

War production plants are now using these units in a total of more than two million horsepower. To any plant whose needs for compressed air fall within the above range, Worthington compressor equipment offers advantages that can contribute greatly to stepped-up output. They are built for users who demand the best equipment.

The following features make Worthington compressors the choice of careful purchasers.

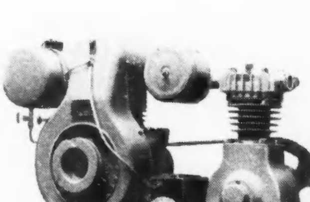
- One-piece Feather Valve . . . lightest, simplest, most efficient.
- Close-grained nickel iron cylinder, honed to mirror surface . . . generously finned for efficient cooling.
- Ground piston, closely fitted in cylinder . . . two compression rings and two oil rings . . . for oil-free air discharge.
- Full-floating wristpin . . . retainer spring prevents scored cylinder.
- Extra-long drop-forged heat-treated connecting rod . . . reduces cylinder wear. Shim-adjusted babbitt crankpin bearing. Graphite-bronze wristpin bushing.
- Drop-forged heat-treated integrally-counterbalanced crankshaft . . . journals ground and polished.
- Adjustable Timken main bearings . . . controlled splash lubrication.
- Force-feed lubrication to all shaft bearings . . . adjustable babbitt main bearings.
- Shaft oil-seal keeps compressor installation clean and oil-free.
- Crankcase ventilator . . . well baffled . . . keeps oil in, and dust out.
- Cast-iron belt wheel with fan spokes . . . good cooling decreases power required.

Worthington vertical compressors are available to those manufacturers whose war production activities give them priority. An authorized Worthington industrial dealer or district office engineer will be glad to assist you with the correct selection for your requirements.

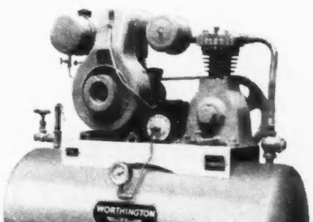


Unit mounted on Massachusetts code vertical tank

Massachusetts code horizontal tank-mounted compressor unit



Base-mounted unit with gasoline engine drive



Tank-mounted unit with gasoline engine drive

AC3-1

WORTHINGTON PUMP AND MACHINERY CORPORATION • HARRISON, NEW JERSEY

Production Speeding Literature

(Continued from page 176)

SAVAGE TOOL CO., Savage, Minn.
Descriptive Circular: DOALL Surface Grinders.

HAMMOND MACHINERY BUILDERS, Kalamazoo, Mich.
Bulletin: Carbide Tool Grinders—Combination Chip Breaker and Cupwheel Grinder.

BRADFORD MACHINE TOOL CO., Cincinnati, O.
Booklets: Speeding Production in Drilling and Tapping Operations; Holemaster Hydraulic Drilling and Boring Machines for Every Purpose.
Bulletin: Metalmaster—A new Lathe.

DETROIT TAP & TOOL CO., Detroit, Mich.
Folder: Detroit Tapping Machines—Thread Gages, Standard and Special Taps, Tap Reconditioning Machines, etc.

CARBORUNDUM CO., Niagara Falls, N. Y.
Booklets: Amer. Standards Assoc. Safety Code for the Care, Use, Protection of Abrasive Wheels; Abrasive Products; Tool Room Grinding; Dressing and Truing of Grinding Wheels; Theory and Practice of Roll Grinding; Cut-off Wheels; Abrasives in the Service of Industry, Mounted Wheels; Finishing Compounds; Diamond Wheels; Gradings—Tool Room Wheels; Carborumdum and Aloxite Brand Grinding Wheel Catalog; Grinding Cemented Carbides with Green-Grit Wheels; Disc Wheels and Cylinders by Carborumdum; Causes and Correction of Common Grinding Errors; Aloxite TP Modern Polishing Practice; Grinding Wheels; Specifications for Grinding Machines.

EASTERN MACHINE SCREW CORP., New Haven, Conn.
Bulletin No. 60: Victory Screw Data Book ($.15).
Folder: Time is Money Saves by Using H & G Insert.

FARREL-BRIMINGHAM CO., INC., Ansonia, Conn.
Descriptive Bulletins: No. 113—Roll Grinder with Traveling Work Table—Type TT; No. 442—The Farrel-Sykes Gear Generator.

TAYLOR MFG. CO., Milwaukee, Wis.
Bulletin: Hi-Duty Drilling Machines.

FOSTORIA PRESSED STEEL CORP., Fostoria, O.
Booklet: Localized Filtering with Coolant Filter in Cutting and Grinding Processes.

O'NEIL-IRWIN MFG. CO., Minneapolis, Minn.
Catalog: Di-Arco System of Metal Duplication without Dies in Parts making—Di-Arco Shears, Brakes, Benders.

GAIRING TOOL CO., Detroit, Mich.
Catalog No. 40-3; Gairing Standard and Special Cutting Tools with Decimal Equivalent Tables.

GREENLEE BROS. & CO., Rockford, Ill.
Booklet: Greenlee at War—High Production Machinery—Machine Tools.

SAVAGE TOOL CO., Savage, Minn.
Circulars: DOALL Gage Blocks—for all general shop work requiring great accuracy; DOALL Surface Grinders.

LINCOLN MACHINE SPECIALTY Co., Chicago, Ill.
Folder: Lincoln Uni-Mill—High Speed Milling Machine Base, High Speed Milling Head, Parts and Accessories.

SOUTH BEND LATHE WORKS, South Bend, Ind.
Book: How To Run A Lathe ($.25).
Booklets: No. 39A—A Machine Shop Course ($.50); No. 36A—How To Cut Screw Threads on a Lathe ($.10); No. 35—How to Grind Lathe Tool Cutter Bits ($.10); Modern School Shops.
Bulletins: H3—Installation and Leveling of the Lathe; H2—Oiling the Lathe.
Instruction Sheets: How to Take Care of Lathes.
Miscellaneous: Blueprint of South Bend Lathe.
Chart: Decimal Equivalents.
Poster: How to Become a Mechanic.

SELLERS & CO., INC., Wm., Philadelphia, Pa.
Booklets: Horizontal Boring, Drilling and Milling Machines; No. 1G Drill Grinder and Cabinet; No. 1G Drill Grinder; No. 4G Drill Grinder; No. 4T Tool Grinder; 4" Boring, Drilling and Milling Machine; No. 6G Drill Grinder; Drill Point Thinning Machine; Self-Acting Injector for Hot Water.

LODGE & SHIPLEY MACHINE TOOL CO., Cincinnati, O.
Booklet: 3A—Duomatic Lathe—for use of Multiple tools in turning, straight and angular facing operations.

McKENNA METALS CO., Latrobe, Pa.
Manual: Kennametal Tools.
Wall Chart: Chip Breaker Chart giving dimensional diagrams for correct grinding of parallel, angular and groove type chip breakers.

WHISTLER & SONS, INC., S. B., Buffalo, N. Y.
Catalog: Dies, Tools and Special Machinery.

EX-CELL-O CORP., Detroit, Mich.
Bulletins: No. 27121—Precision Machine Tools and Cutting Tools; 481212—Selected Thread Systems, Forms and Measurements; Internal Lapping Machine, Style 71; Diesel Fuel Injection Equipment, Model A; Precision Boring Machines—Style 215-A; 1212-A; 218; 2112-A; 112-C; Precision Thread Grinders—Style 33 and 33-L; 31 and 31-L; 39-A and 39-L; 50; 35 and 35-L; Carbide Tool Grinder—Style 46; Style 48.

FELLOWS GEAR SHAPER CO., Springfield, Vt.
Catalog: The Fellows Method—Applications of Fellow Gear Shapers and Gear Shaper Cutters—and other equipment for cutting, finishing and testing gears.
Circular: Straight-Line Gear Generator.

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Official U. S. Army Photo

Here's What It Takes To Build Your Glory Road

When a Colonel of engineers said the new Alcan Highway—the "Glory Road of America"—was built by "guts and tractors" he stressed the former.

ALTER EGO: And how right he was! When tough "competition" from the west threatened to annihilate us, it jolted us into super-action. Alcan's 1800-mile route through uncharted wilderness — said to be *impassable* — was a confusion of mud, mountains and mosquitos. Under the spur of Jap "competition", we finished this "glory road" in one season.

Maybe that's a lesson for us to be on the alert for the tough competition that'll invade all business after the war. Let's jolt ourselves into super-action now.

ALTER EGO: Right! We've got to hack through plenty of uncharted wilderness that seems impassable . . . with little time on our hands . . . and come out with *better products* and *lower costs* than the other fellow. *Will-power* and *ingenuity* will build *this* "glory road".

We have the will-power. Let's acquire the ingenuity by improving our welding knowledge *with Lincoln's aid.*

Ask your inner self if welding knowledge isn't the shortcut to postwar success.

THE LINCOLN ELECTRIC COMPANY • CLEVELAND, OHIO

TOBIN-ARP MFG. CO., Minneapolis, Minn.
Folders: Shell Bearing Boring Machine Model SB; Model SB-A Rod Boring Attachment; Line Boring Machine.
UNION DRAWN STEEL DIV., Republic Steel Corp., Massillon, O.
Booklet: Steel Handbook No. 42—for Machine Tool Users.
ARTER GRINDING MACHINE CO., Worcester, Mass.
Descriptive Bulletins: Arter Model A Rotary Surface Grinders Arter Model B Rotary Surface Grinder.
KEARNEY & TRECKER CORP., Milwaukee, Wis.
Book I: Milling Practice Series—Right and Wrong in Milling Practice.
GORTON MACHINE CO., George, Racine, Wis.

Production Speeding Literature

(Continued from page 178)

Catalog: Milling, duplicating and pantograph machines and accessories—applications, instructions for use and care.
CONTINENTAL MACHINES, INC., Minneapolis, Minn.
Text Book: Illustrated scientific data on the many uses and adaptations of DOALL Contour Saws.

WELDING, BRAZING AND SOLDERING

RANSOME MACHINERY CO., Dunellen, N. J.
Bulletins: No. 205—Welding Positioners—20 ton cap.; No. 200—Welding Positioners—2500 tons to 8 tons.
PROGRESSIVE WELDER CO., Detroit, Mich.
Bulletins: No. 801—Seam Welders; No. 101—Revers-O-Charge Welding Equip.; No. 601—Press Welders; No. 701—Rocker-Arm Welders; No. 301—Temp-A-Trol Forge Welders.
GENERAL ELECTRIC CO., Schenectady, N. Y.
Booklets: Arc Welding Accessories for Women; How to Figure Arc Welding Speed; How to Repair Tools and Dies by Atomic-Hydrogen Welding; Atomic-Hydrogen Arc-Welding Equipment; How to Maintain Arc Welders; A Complete Line of Arc-Welding accessories, How to Adjust and Operate the Atomic-Hydrogen Electrode Holder; Resistance Welder Control.
AMERICAN MANGANESE STEEL DIV., American Brake Shoe and Foundry Co., Chicago Heights, Ill.
Booklets: Welding Products; Dieweld Welding Rods—Electrodes.
RUBY CHEMICAL CO., Columbus, O.
Catalog: Sheet: Soldering and Tinning Flux.
Folder: Rubyfluid Makes Soldering Easy.
ALUMINUM CO. OF AMERICA, Pittsburg, Pa.
Booklet: Welding and Brazing Alcoa Aluminum.
WELDING EQUIPMENT & SUPPLY CO., Detroit, Mich.
Booklets: Reclamation by Welding of High Speed Steel Tools; Eureka Tool Steel Welding Wires.
Folders: Reclamation of High Speed Tools by Suttonizing—A Welding Process; Reclamation of High Speed Tools; Eureka Alloy Electrodes.
SCIAKY BROS., Chicago, Ill.
Booklets: Welds—Thick and Thin; P.1R. Radial Portable Welders.
Data Sheets: Welding.
THOMSON-GIBB ELECTRIC WELDING CO., Lynn, Mass.
Feb. Issue of Flashes: Production Welding Units.
LINCOLN ELECTRIC CO., Cleveland, O.
Books: Procedure Handbook of Arc Welding Design and Practice ($1.50 in U. S.); Lessons in Arc Welding ($.50) in U. S.).
Bulletins: The Fleet-Fillet Welding Technique; The Lincoln Shield-Arc—practical applications of Shield-Arc welding in numerous industries; The Lincoln Weldirectory; Conservation of Welding Electrodes.
Chart: Arc Welding Inspection.
Machine Design Sheets—a redesign study.
ALLEGHENY LUDLUM STEEL CORP., Pittsburgh, Pa.
Booklet: Welding of Stainless Steels—dealing with the problem of welding various varieties of stainless steel.

RIVETING & FASTENING

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa.
Booklet: Method, data and tables on riveting aluminum.
ILLINOIS TOOL WORKS, Chicago, Ill.
Catalog Ad-2; Shakeproof Cowl Fasteners—Engineering and Procurement Data.
PALNUT CO., INC., Irvington, N. J.
Bulletin: Locknuts and Self-Locking Nuts.
CHERRY RIVET CO., Los Angeles, Cal.
Handbook A-43; Make the Hard Jobs Easy With Cherry Blind Rivets.
AMERICAN NUT & BOLT FASTENER CO., Pittsburgh, Pa.
Folders: Live Action Spring Washers—Carbon, Alloy, Stainless Steels, Everdu, Phosphor Bronze, Duronze.

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The short slow steps of regular progress in machine and product development have lengthened to ground covering strides. It's as though some magic means had enabled industry to traverse time just as the legendary seven league boots quickly carried their wearer across great distances. Machines and methods which would not have appeared normally until 1960 are smashing production records now, in 1943.
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Production Speeding Literature

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CLEANING, PLATING & RUST PREVENTING

duPONT deNEMOURS & CO., E. I., Wilmington, Del.
Booklet: Electroplating Chemicals; Processes, Materials.
Catalog: Molten Salt Baths.

U. S. GALVANIZING & PLATING EQUIPMENT CORP., Brooklyn, N. Y.
Booklet: Methods and Equipment for Electro-Plating.

INSPECTION, TESTING & CONTROL

BRISTOL CO., Waterbury, Conn.
Catalog of Bristol Automatic Control and Recording Instruments.

Bulletins: F-500—Flow Meters; A-112—Convertible Air-Operated Free-Vane Controllers.

LEEDS & NORTHRUP CO., Philadelphia, Pa.
Catalogs: N-27—Micromax Speed Recorders; N-93-163—Smoke Density Recorders; N-95-163—Signalling Controller; T-625 Homo Method for Tempering; N-33A—Thermocouple Pyrometers; N-28-160—Centrimax Flowmeter; N-33-163 Temperature Control for Super-Heated Steam; N-57-161—Frequency Recorders and Indicators; N33C — Resistance Thermometers; N-33D — Optical Pyrometer Potentiometer Type; E-1940—Electrical Measuring Instruments.

ROWE RADIO RESEARCH LABORATORY CO., Chicago, Ill.
Pamphlets: Oscillograph Accessory Apparatus; Electronic Equipment to Study Detonation in an Engine; Angular Sweep.

TAYLOR MFG. CO., Milwaukee, Wis.
Bulletins: HI-EFF Dynamometers; Static Universal Balancing Machines.

WHEELCO INSTRUMENTS CO., Chicago, Ill.
Bulletins: G32-2—Thermometer data; G503-2—Therm-Otrol; G603-2—Therm-Otrol Industrial Indicating Control Thermometer; G403-2 — Recording Thermometers; G303-2 — Indicating Thermometers.

GENERAL ELECTRIC CO., Schenectady, N. Y.
Catalog: G-E Controls.
Booklet: Electronics—A New Science for a New World.

SHEFFIELD CORP., Dayton, O.
Catalog No. 42-2; Sheffield Gages ($1.50).
Book: Dimensional Control ($1.50).
Booklets: Gagging Policy (Supplement to first edition of Dimensional Control; Sheffield Master Craftsmen.
Folder: Sheffield Multichek.

FEDERAL PRODUCTS CORP., Providence, R. I.
Booklets: Dial Indicator Inspection Gages for Shells; War Material Dial Indicator Inspection Gages.
Catalog No. 41: Federal Measuring Instruments.

TRIMOUNT INSTRUMENT CO., Chicago, Ill.
Folder: Trimount—Well Type Hanometers; Sliding Scale U—Tube Manometers.

ATC CO., INC., Philadelphia, Pa.
Bulletins: Industrial Controls—Temperature, time, level, flow and pressure.

WILBERTON & CO., THOS., Cedar Grove, N. J.
Bulletin: Master Surface Angle Plate—For Speeding Inspection in Inspection Department and Tool Room.

STANDARD ELECTRIC TIME CO., Springfield, Mass.
Catalog: Clock, Signal, Alarm Systems, etc.
Folder: Precision Timers—for measuring time intervals.
Bulletin No. 155: Test Panels—Precision Timers, Chrono-Tachometers.

MAGNAFLUX CORP., Chicago, Ill.
Folders: Magnaflux for Magnetic Particle Inspection; Zyglo—For Detection of Flaws in Non-Magnetic Metals; Magnaglo—For Detection of Structural Flaws.

CAMBRIDGE INSTRUMENT CO., INC., New York, N. Y.
Booklets: Cambridge Needle Pyrometers for Temperature Determination of Materials in Plastic State, and During Certain operations; Cambridge Surface Pyrometers; Preiision Instruments; Exhaost Gas Tester.

ANDERSON CO., Gary, Ind.
Descriptive Circular: The Distometer System of Indication and Controis—for remote indication of position, speed, temperature, pressure, liquid level, weight airflow and other variable factors or physical conditions.

CURRAN CORP., Malden, Mass.
Catalog Supplement: Gunk Hydro-Sealed Carbon Gum Digester, a High Performance Aviation Metal Cleaner and Paint Stripper.

GENERAL CONTROLS CO., Glendale, Cal.
Catalog: General Controls—Thermostats, Gas Controls, Strainers, Transformers, Switches, Magnetic Valves, Motor Valves, Relays, Low Water Cutouts, Package Sets, Timer Sets, etc.
Circular: Sensitive d-c Relays for Vacuum Tube Circuits, Mobile Radio, Thermo-Eleceric, Photo-Electric and Thermostatic Control.

CENTER SCOPE INSTRUMENT CO., Los Angeles, Cal.
Booklet: Uses and advantages of the Center Scope Optical Method of locating centers with unquestioned accuracy.

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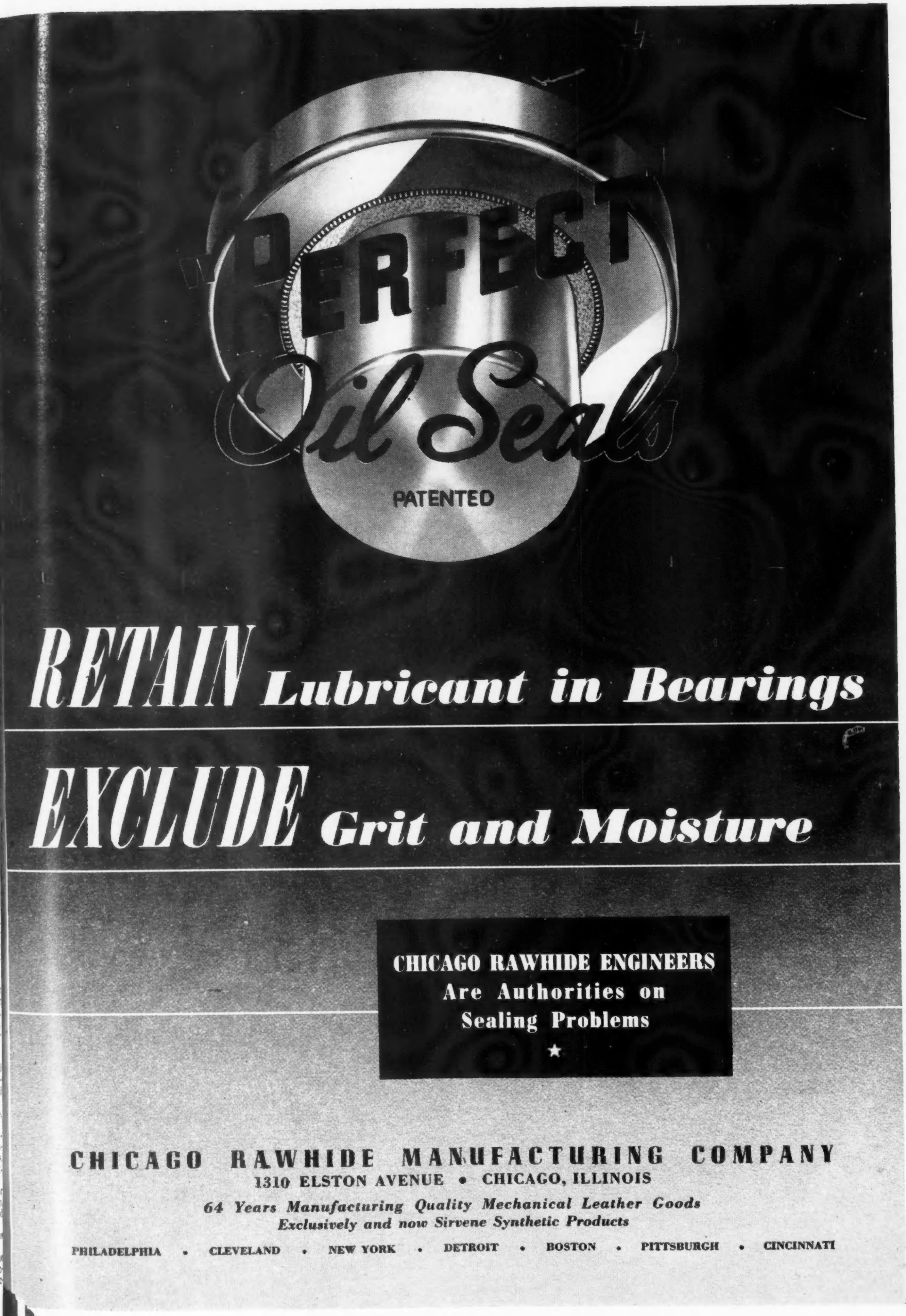

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Production Speeding Literature

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PRATT & WHITNEY DIV., Niles, Bement, Pond Co., West Hartford, Conn.
Circular No. 469: Descriptions and applications of the various types of Electrolimit External Comparators.

FORD MOTOR CO., Johansson Div., Dearborn, Mich.
Catalog No. 15: Johansson Gage Blocks and Accessories.
Folder: Inspection Service — Johansson Gage Blocks and Accessories.

HEAT TREATING, MATERIALS HANDLING & GENERAL PLANT EQUIPMENT

HOLCROFT & CO., Detroit, Mich.
Booklet: Holcroft Heat Treating and Carburizing Furnaces.

PITCHER CO., H. L., Detroit, Mich.
Catalog: Industrial Handling Equipment Trucks and Casters.

BRUNNER MFG. CO., Utica, N. Y.
Catalog and Sales Manual No. 34—Air Compressors.

HARVILL CORP., Los Angeles, Cal.
Folder: Hydraulic Hand Pumps, Model 66-2000 Series—Applications and performance data.

MALL TOOL CO., Chicago, Ill.
Booklet: Instructions for Assembling and Operating Portable Electric Flexible Shaft Machines.
Folder: Portable Flexible Shaft Machines.

PENN METAL CORP. OF PENNA., Philadelphia, Pa.
Bulletin on wood lockers, shelving, industrial storage, etc.

CARRIER CORP., Syracuse, N. Y.
Folder: Nonfreeze Heat Diffusers; Carrier War Plant Ventilators; Air Conditioning, Refrigerating, Heating, Humidifying and Cooling by Evaporation and Air Circulation.

NORTON CO., Worcester, Mass.
Booklet: Norton Abrasives for Portable Grinders.

NICE BALL BEARING CO., Nicetown, Philadelphia, Pa.
Descriptive Circular: The New Nice Red Diamond Ball Bearing Casters.

BAKER INDUSTRIAL TRUCK DIV., Baker-Raulang Co., Cleveland, O.
Descriptive Bulletins: 5-Ton Low-Lift Truck; 5-Ton Hy-Lift Truck; Centre-Control Fork Truck; Locomotive Type Crane Truck; Locomotive Type Crane Truck.

ROSS ENGINEERING CORP., J. O. New York, City, N. Y.
Bulletins: Industrial Ovens; Air Heaters.

SHEPARD NILES CRANE & HOIST CORP., Montour Falls, N. Y.
Booklet: Maintenance and Operation of Shepard Niles Electric Crane and Hoists.

CLING-SURFACE CO., Buffalo, N. Y.
Handbook: Modern Mechanical Power Transmission for Industry.

MOTO-MOWER CO., Detroit, Mich.
Booklet: A Sweeping Crew on Wheels.

STANDARD CONVEYOR CO., North St. Paul, Minn.
Catalog: Conveyors by Standard.
Bulletin: Standard Equipment in Armament Production.

ACME STEEL CO., Chicago, Ill.
Booklet: Acme Unit-Load.
Folders: Silver Stitchers; Skid-Load Process Savings; Acme Steelstrap; Steel Strapping Shipments.

BALDWIN LOCOMOTIVE WORKS, Philadelphia, Pa.
Booklet: Baldwin Locomotives.

AUBUDON WIRE CLOTH CORP., Philadelphia, Pa.
Bulletins: A and F Metalwove Belts; G—Metal Wove Belts of Chain Drive Type.

TRANE CO., Lacrosse, Wis.
Bulletins: S-363—Quenching Oil Cooling Systems; DS-385—Heating Coils; S-366—Trane Wartime Products.

BOWSER CO., INC., S. F., Fort Wayne, Indiana.
Catalog: Industrial Equipment.
Catalog Sheet: Type BB Filtering and Sterilizing Unit.
Folders: Flow Indicating Devices; Pressure Filters.
Booklet: Turbine Oil Conditioning.

BOYER-CAMPBELL CO., Detroit, Mich.
Catalog No. 50: Equipment for Accident Prevention.

AMERICAN FOUNDRY EQUIPMENT CO., Mishawaka, Ind.
Manual: Wheelabrator Operator's Manual.
Booklets: A B C of Wheelabrator Blade Care; American High Efficiency Cyclone Dust Collector.
Catalog No. 72: American Dutube Dust Collectors.

STERLING GRINDING WHEEL DIV., Cleveland Quarries Co., Tiffin, O.
Folder: Portable Grinding.

DISSTON & SONS, INC., HENRY, Tacony, Philadelphia, Pa.
Conservation Control Card: No. 1—Power Hack Saw Blades; No. 15—Right and Wrongs in Refitting Circular Saws; No. 17—Narrow Wood Cutting Band Saws.
Manual—Disston Products.
Booklet: Conservation Serves Everyone.

STANDARD ELECTRIC TIME CO., Springfield, Mass.
Circulars: Synchronous Type Program Clock; Air Raid Signals.

REEVES PULLEY CO., Columbus, Ind.
Booklet: How to Speed Up Production With Variable Speed Control.
Folders: How Reeves Helps Sharpen the Eagle's Claws; Reeves Vari-Speed Jr.; Reeves Variable Speed Control.

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Bearing Alloys With Low Tin Content

The bearing bronze most widely used in bushings in which the shaft runs directly on the bronze is constituted of 80 per cent copper, 10 per cent lead and 10 per cent tin. This is practically identical with the composition of S.A.E. Specification 64 — Phosphor Bronze Castings. Experiments made at Battelle Memorial Institute have shown that satisfactory bearing alloys can be made with a tin content as low as 2.8 per cent or, for some purposes, with no tin at all. Two of the alloys developed were found to be much better for some purposes than the standard 80:10:10 alloy. Both of these contained no tin at all, it being replaced by copper in one and by copper, silver and phosphorus in the proportion 4:5:1 in the other. Another alloy in which tin was reduced to 2.8 per cent by the substitution of antimony and copper proved to have practically the same performance characteristics as the standard alloy.

CENSORED

An exclusive feature prepared by M. W. Bourdon, special correspondent of Automotive *and* Aviation Industries in Great Britain.

Lord Nuffield, founder and chairman of the Nuffield (Morris Motors) organization, has made a further gift of £10,000,000 to the nation for medical and industrial research, the development of health services, social studies and the care of the aged. This brings the total of his gifts for the public welfare to over £25,000,000. He will hand over shareholdings in his companies to the value mentioned to trustees for the administration of the income. Lord Nuffield makes it clear that he is not withdrawing from his association with his many business interests, with which he will be identified precisely as hitherto.

The fleet of 450 emergency food vans presented to Britain by Henry and Edsel Ford carried 16,000,000 meals to the people during 1942. Children were the chief "customers", 177 of the vans being employed daily in carrying hot meals to schools. Others supplied farm workers, dockers, employes in small plants lacking a canteen and demolition workers among many other classes of the population. The vans made nearly 69,000 journeys, covered 900,000 miles and carried an average of 225 meals per journey. The food is carried in specially-devised containers enabling it to be kept hot for several hours. The vans are maintained voluntarily by Ford dealers.

Many British aircraft are now being fitted with a new type of automatic pilot (known as "George" by the R.A.F.). Whereas the normal type functions only when the aircraft is flying on a straight and level course, the new unit works equally well no matter in what attitude the machine is flying. So long as the pilot holds the control "stick" the new "George" remains inoperative, but should the pilot's hands leave the control (through injury causing partial or complete loss of consciousness, for example) the device automatically comes into effect and will prevent the machine from crashing by pulling it out of a dive or rectifying any other violent maneuver. No constructional details have yet been released.

Squadron Leader H. M. McKenna, a director of Short Brothers, the makers of the Sunderland flying boats and other aircraft, stated at a public meeting that the company was contemplating the construction immediately after the war of flying boats for passengers and freight with an all-up weight of about 100 long tons, a power plant of around 18,000 hp., a cruising speed of 275 m.p.h. and a range of not less than 3,000 miles.

During a debate in the House of Lords on the equipment of the Fleet Air Arm, Lord Beaverbrook revealed that Bristol Beaufighters were now in service as torpedo-bombers and that the North American Mustang has been fitted with a Rolls Royce Merlin engine, presumably of Packard manufacture, judging by the flattering terms in which Lord Beaverbrook had just previously been speaking of the Packard-produced Merlin.

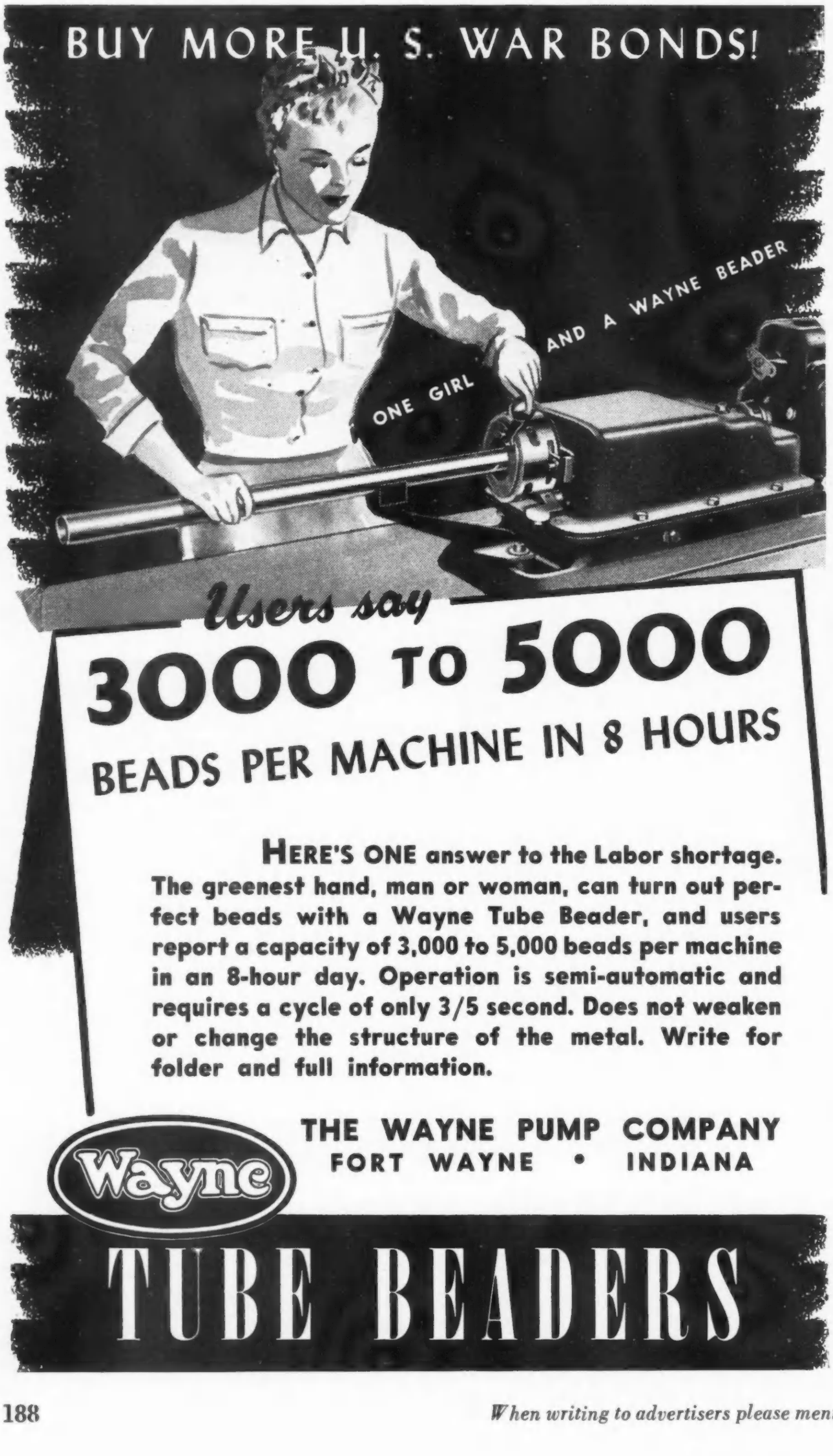
The London Passenger Transport Board, operating all London and suburban buses, has adopted a program providing for approximately 550 of its buses to be fitted with producer gas plant for use in both Central London and country areas.

After the War—What?

The first two years or so after a war, as past experience reveals, are the easiest not the hardest. Stimuli rooted in the war still continue—but in a reverse way. Just as the extraordinary war demands stimulate and point the way for the expansion of war production, so the accumulated needs resulting from wartime restrictions and the consequent shortages stimulate and point the way to the resumption of peace production on a vast scale in order to meet urgent replacement requirements. Economic difficulties are more likely to occur after the replacement period is over and the demand cycle produced by the war has ended.

While we may thus look forward with reasonable assurance to the period of transition immediately following this war, it should be soberly noted here that the replacement process will not of itself have solved our longer-run basic economic problems. That is to say during this interval the forces responsible for a relatively satisfactory level of production and employment will not have brought a solution of such problems as the following: (a) the huge public debt and the unbalanced budget; (b) the re-establishment of balanced international trade and financial relations; (c) agricultural adjustment, both to the domestic and the world situation; (d) the relations of labor and management; (e) the maintenance of an effective balance between consumption and productive capacity; and (f) effective co-operation between government and industry. The real test of this country's ability to maintain prosperous conditions will come after the comparatively easy period of transition. Our future will depend upon the progress which we can make *during the transition period* toward the elimination of basic sources of economic maladjustment. Unless genuine progress toward the solution of these problems can be made, we would find ourselves little better off than we were before the war. Indeed, we would be *worse* off for we would have added the complications of a vast new public debt.

From "Collapse or Boom at the End of the War," published by the Brookings Institution.



MEN

(Continued from page 150)

Folke Richardz, of Westinghouse Electric & Mfg. Co., has been appointed manager of engineering in the company's Gearing Dept. at the Nuttall Works, Pittsburgh, Pa.

H. M. Rowlette has been elected vice-president and general manager of the Whiting Corp.'s Canadian subsidiary, Whiting Corp., Ltd., and will have offices at its new location 45 Richmond Street, West, Toronto.

The Directors of General Motors Corp. have elected **Thomas P. Archer** vice-president in charge of the Corporation's manufacturing and real estate staffs. He was formerly assistant general manager of the Fisher Body Div. of General Motors.

H. A. Loughran, passive defense director of Brewster Aeronautical Corp., was elected chairman of the Long Island Aircraft Security Conference.

F. Carl Hirdler, Jr., chemist and processing engineer, has joined the Los Angeles laboratory staff of Turco Products, Inc.

The Penna. Rubber Co. has announced the appointment of **C. E. Hannum** as assistant sales manager of the company.

Walter C. Dodge, Jr., of Ferodo and Asbestos, Inc., New Brunswick, N. J., has been elected president of the National Standard Parts Association.

Timothy E. Colvin, vice-president of Aircraft Accessories Corp. has been appointed executive vice-president in charge of the Burbank Div.

William S. Long, former Pacific Coast manager of United States Rubber Company's war products division, has been appointed to the newly created position of operations manager of the company at Los Angeles.

C. L. Cummins, president of the Cummins Engine Co., has been appointed executive consultant on Diesel Engine Production to the War Production Board, with headquarters in Washington, D. C.

Announcement has been made of the appointment of **Frederick R. Cross** as general manager in charge of all phases of the Lubricating Equipment Div. of Aro Equipment Corp., Bryan, O.

J. W. Klapp has been made sales manager of the WHIZ Household Div., R. M. Hollingshead Corp. and N. T. Corson has become general manager of the ALL-NU Products Div.

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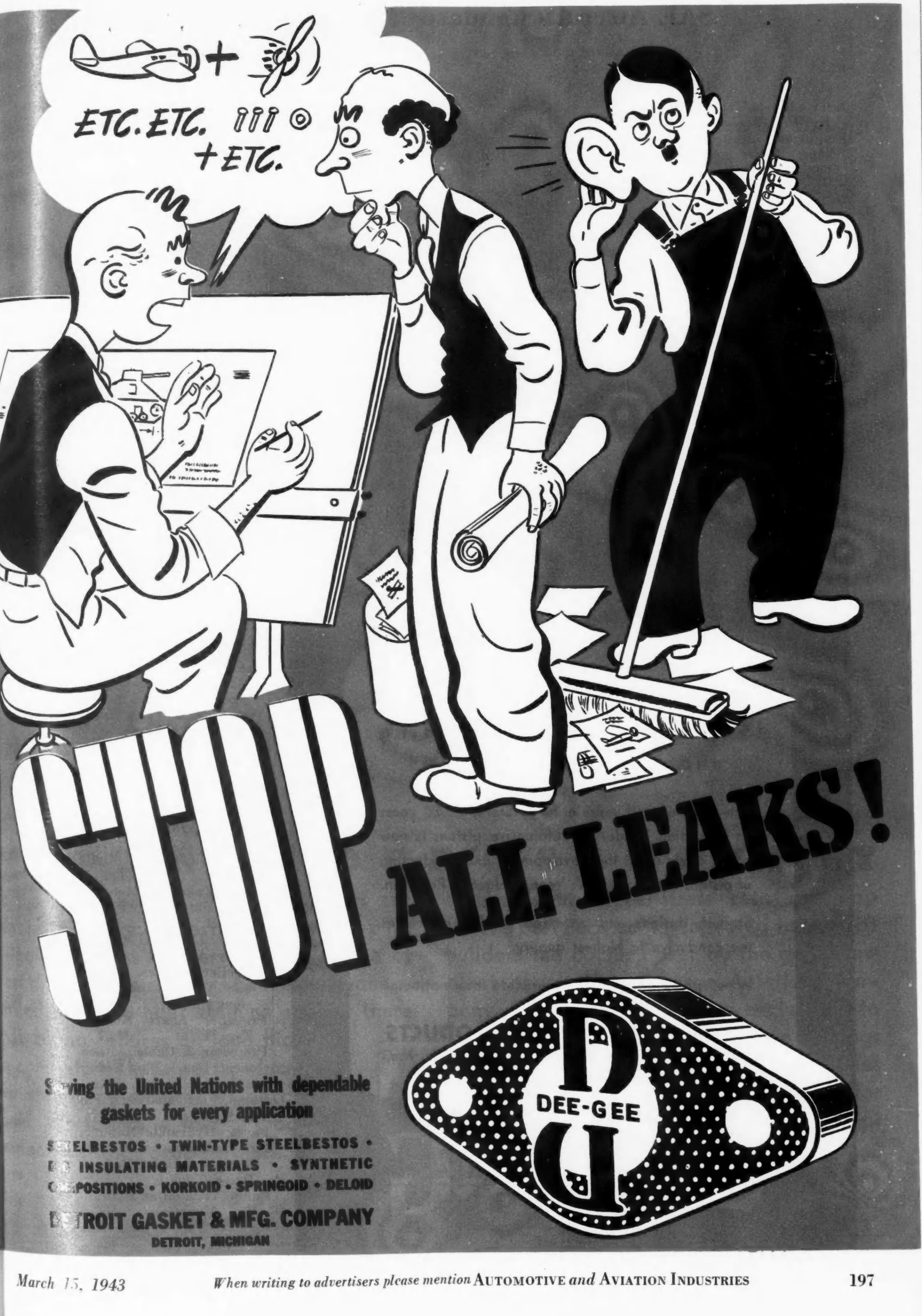
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DETROIT, MICHIGAN
DEE-GEE

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Screw Heads, Flat Fillister, Large Fillet...... AS 135
Screw Threads, Aeronautical .... AS 83
Screw Thread Form, American National, Modified (National Round—NR). AS 82
Snap Ring, Non Controllable Propeller Hub..... *AS 94
Spark Plugs, Aircraft Engine—18 MM .... AS 28
Splines, Involute .... AS 84
Starter, Mounting Pad and Drives, Types I, II, III, IV AS 44
Surface Finish .... AS 107
Symbols and Sketches for Pressure and Temperatures in Induction System —Aircraft Engine ..... AS 21

T

Tachometer Drive—Type I AS 54
Tachometer, Mounting Pad and Drive—Type II..... AS 55
Temperature Control Equipment, Automatic Airplane Cabin .... *ARP 89
Tests, Aircraft Hydraulic Equipment .... AS 23

W

Washers, Plain — Aircraft Engine .... AS 36

* New Aeronautical Standards issued as of January 1, 1943.

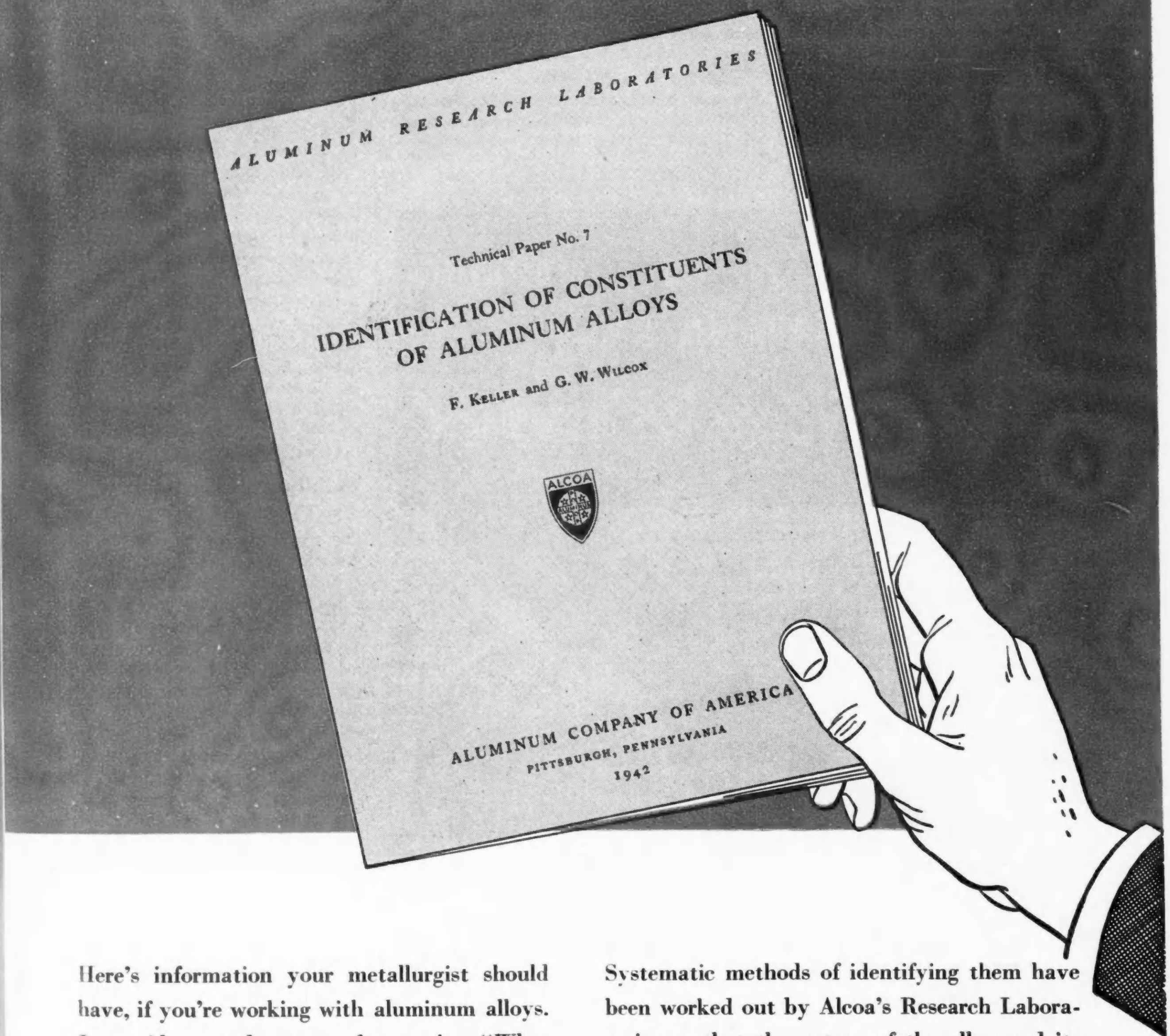
New Surface-Hardening Process

Such articles as serrated and splined shafts, gear wheels and other parts with projections on them, usually are case-hardened or flame-hardened locally by quenching. These processes, as a rule, are applicable only to alloy steels and are somewhat complicated. It is reported that the Krupp firm in Germany now has developed a salt-bath hardening process which can be applied to ordinary carbon steels with about 0.8 per cent carbon and a small vanadium content. Equally good results are said to be obtained as with the usual methods, and conserves strategic materials.

Articles to be hardened are first dried in an air oven at 390 F, are then preheated in a salt bath at between 1075 F and 1110 F, are next immersed in another salt bath for hardening at 1500 F—1500 F, and finally quenched in a salt bath at 400 F. The specific heat and heat conductivity of this quenching bath (which, of course, depend on its composition) are such that no martensite is formed during immersion, and hardening takes place only as the articles cool to room temperature.

Any salt that may adhere to the quenched articles is removed with boiling water, and the articles are finally tempered to the desired hardness at 300 F to 400 F in an oil bath or an air oven. This tempering process takes from ½ to 2 hr, depending on the mass of the parts. Variations in the depth of the hardened case are brought about by changes in the composition of the steel. The composition of the quenching bath must be accurately controlled. The rate of cooling, on which the hardness produced depends, is affected by moisture absorbed by the bath from the atmosphere, and to drive off such moisture, the bath must be heated to 660 F for six hours every 14 days.

To help your metallurgist tell *"What's in it?"*



Here's information your metallurgist should have, if you're working with aluminum alloys. It provides a ready means of answering, "What type of aluminum alloy is it?"

Technical Paper No. 7 presents metallographic methods for examining aluminum alloys. How to prepare a specimen is told in detail; cutting the sample, mounting, polishing and etching.

Metals alloyed with aluminum form a variety of constituents of microscopic size. Systematic methods of identifying them have been worked out by Alcoa's Research Laboratories so that the nature of the alloy and its metallurgical treatment are revealed by the microscope. Chemical etching treatments color the constituents and reveal their form so that they can be identified by the systematic pictorial guide provided in this technical paper.

Your metallurgist may want a copy of Technical Paper No. 7. Write Aluminum Company of America, 2110 Gulf Bldg., Pittsburgh, Pa.

ALCOA ALUMINUM

ALCOA ALUMINUM REG. T. M.

The Ideal Safety Man

From a paper presented at the National Safety Congress

Experience as well as training should be looked at when we hire the ideal safety man. Where has he been, what has he seen, who has he known?

I'd like him to have had experience in the type of business he is to do his safety job in and I'd like that experience to have been on several different levels. If he is going to do safety work in the corn starch business, for example, I'd like him to have had jobs in the mill house, the packing house, the maintenance shops, the laboratory and the office before he starts on the safety job. He should have, at any rate, done some sort of work with his hands and some sort with his head. He should be able to talk to the janitor and the president and he should be able to appreciate both points of view.

First, he should be a combination chemist, mechanical, electrical, sanitary, civil and structural engineer, because he'll run into problems involving all of those professions when he tries to produce a work environment free of all mechanical hazards. Second, he should be an advertising manager, an editorial writer, a competent psychologist and a good public speaker so that he may do a sound job of educating workers to avoid the hazards not yet susceptible to engineering.

Third, he should be a doctor so that he can have some knowledge of the healing arts and the rehabilitation necessary for those who fall victim to his having done a less than perfect job of accident prevention and a lawyer so that he may know his rights and duties of the employee and his employer.

If that isn't enough—he should also be a time study engineer because the speed and effort with which men work have a definite bearing on their safety. If they work too hard and fast they are tense and nervous: if too slow they wool-gather.

I might add that the safety man should also be a purchasing agent because he is buying a specialized type of equipment but I am inclined to think that, if he masters all of the professions just mentioned, he'll automatically do a good job of purchasing.

Collaboration

Practically it just isn't possible for any one man to have an expert knowledge of all those fields. But we *can* gain a rudimentary knowledge of those things from reading and study and, for detailed expert information, we can develop pipe lines, pipe lines of information. Practically all of us work for firms that have experts in all of those fields and it's our job to get and stay on such terms with those experts that we can call on them for help when our problems need specialized treatment. That's what every operating executive does, for they face the same problem we do. They can't know every detail of their business, so they hire dependable experts to know them. The ideal safety man will enlist the help of all of those experts in doing his job. Without them he is lost. With them, every technical problem can be solved.

Perhaps you're wondering if that's quite honest. Perhaps you're heard the story of the man who sent back a questionnaire unanswered saying that he did not make a habit of answering questionnaires and neither did he make a habit of milking other people's cows.

If the safety man were a different sort of specialist than he is perhaps the pipe lines I have mentioned could be considered dishonest. If he were an accountant trying to get other accountants to tell him how to do his job, I'd say he was dishonest; that he was obtaining money under false pretenses. Or if a civil engineer had to ask the advice of every other civil engineer he knew before he could lay out a railroad siding I'd say he was dishonest, that he was getting someone else to earn his living for him.

(*Turn to page 206, please*)

Physical Properties of "Bakelite" MOLDING MATERIALS

Thermosetting General-Purpose Phenolics

These materials provide well-balanced combinations of dimensional stability and other physical properties suitable for everyday requirements. *Impact strength:* 0.26 to 0.40 foot-pounds per inch of notch (Izod). *Tensile strength:* 6,500 to 8,500 pounds per square inch. *Flexural strength:* 8,500 to 13,000 pounds per square inch.

Thermosetting Shock-Resistant Phenolics

Four types, offering a wide range of physical properties. All types are dimensionally stable, and resistant to wear and abrasion. Depending upon type, *impact strength:* from 0.46 to 5.4 foot-pounds per inch of notch (Izod); *tensile strength:* from 5,300 to 8,500 pounds per square inch; *flexural strength:* from 6,300 to 11,000 pounds per square inch.

Thermosetting Phenolic Molding Boards and Blanks

These are medium-high, impact materials that may be used in molds built for general-purpose phenolics. Can be used alone, or with other plastics to provide reinforcement at vital points. Supplied as board stock or as blanks approximating shape of finished part. Also sold in diced form suitable for automatic preforming. Depending upon type, *impact strength:* from 1.6 to 2.0 (with grain) and 0.6 to 0.9 (against grain) foot-pounds per inch of notch (Izod); *tensile strength:* from 3,000 to 11,000 pounds per square inch; *flexural strength:* from 8,400 to 25,000 pounds per square inch.

Special Phenolics

This group comprises a variety of dimensionally stable, thermosetting materials, for special requirements of heat resistance, low power factor, chemical and water resistance, low friction coefficient, opacity to X-rays, and transparency.

Thermosetting Ureas

Most color stable and hardest of all thermosetting plastics. *Impact strength:* from 0.30 to 0.36 foot-pounds per inch of notch (Izod); *tensile strength:* from 9,500 to 12,000 pounds per square inch; *flexural strength:* from 10,000 to 14,000 pounds per square inch.

Thermoplastic Cellulose Acetates

Two types—Class I, general purpose, for compression and injection molding, and Class II, heat- and water-resistant, for injection molding only. Both types noted for high impact strength, toughness, and wide color range. *Impact strength:* from 1.4 to 4.0 foot-pounds per inch of notch (Izod); *tensile strength:* from 2,500 to 9,500 pounds per square inch; *flexural strength:* from 5,000 to 15,000 pounds per square inch.

Thermoplastic Polystyrenes

Outstanding in dimensional stability, chemical resistance, and dielectric qualities. For compression as well as injection molding. Supplied as crystal-clear material, and in transparent and translucent colors. *Impact strength:* from 0.40 to 0.70 (compression-molded), 0.8 to 1.2 (injection-molded) foot-pounds per inch of notch (Izod); *tensile strength:* 5,500 to 6,500 (compression), 6,500 to 7,000 (injection) pounds per square inch; *flexural strength:* 6,500 to 7,500 (compression), 14,000 to 19,000 (injection) pounds per square inch.

Physical Properties of Laminated Plastics made with "Bakelite" LAMINATING VARNISHES

BAKELITE Laminating Varnishes are used in the production of paper-base and fabric-base laminated sheets, tubes, and rods. Laminated plastics made from these varnishes possess excellent dimensional stability, high impact, tensile, and flexural strength, and are extremely resistant to wear and abrasion. In addition, they offer an unusual combination of other properties such as high dielectric strength, resistance to corrosion, and immunity to water, brine, oil, ordinary solvents, most acids, and weak alkalies.

Physical Values

Tensile strength of standard paper-base grades ranges from 7,000 to 12,500 pounds per square inch; flexural strength (transverse), from 15,000 to 21,000 pounds per square inch; and compressive strength, from 22,000 to 36,000 pounds per square inch. For standard fabric-base grades, tensile strength ranges from 8,000 to 10,000 pounds per square inch; flexural strength (transverse), from 17,000 to 20,000 pounds per square inch; and compressive strength, from 35,000 to 38,000 pounds per square inch.

Sheets, Rods, Tubes, Special Shapes

Laminated sheet stock and gear stock is supplied by laminators and fabricators in various thicknesses and sizes. Tubing can be obtained in lengths from 36 inches, with I.D. from 3/16 of an inch to 72 inches. Larger tubing can be made for special requirements. Rods come in standard lengths up to 48 inches, and in diameters from 1/8 of an inch to 4 inches. Special shapes are made to order.

Special Types

In addition, special laminated plastics have been developed for specific mechanical requirements. Molded-laminated plastics permit the manufacture of such unusually tough and wear-resistant products as heavy-duty bearings. Rubber-laminated plastics combine the rigidity and mechanical strength of laminated plastics with the vibration-absorbing qualities of the rubber interlayer. Tough, densified-laminated woods also are made possible by impregnating wood veneers with a laminating varnish and subsequently applying heat and pressure.

Physical Properties of "Bakelite" BONDING MATERIALS

Phenolic and Urea Resin Wood Glues

For bonding plywood and other wood products. Glue line is dimensionally stable under extreme conditions of heat, cold, moisture, and impact shocks. Bonded woods are resistant to mould growth.

Resin Cements for Lamp Basing

Because of their dimensional stability when subjected to heat, BAKELITE Resin Cements are used widely to set electric light bulbs and radio tubes in their metal or plastic bases. Mechanical shock or vibration does not impair the bond.

Resin Cements for Bristle Setting

A tough, tenacious bond for bristles used in brushes of all types is provided with BAKELITE Resin Cements. The bond obtained is unaffected by constant use, or by frequent cleaning in water or solvents.

Bonding Resins for Glass and Mineral Wool

To form glass, rock, and mineral wool into easily handled, dimensionally stable insulation batts, the fibers are bonded together with BAKELITE Resins. Heat cold, and moisture do not affect bonding strength.

Bonding Resins for Abrasive Products

Abrasive grit used to form high-speed grinding and cut-off wheels is securely bonded with BAKELITE Resins. This tough, strong bond has made it possible to operate grinding wheels safely, at speeds considerably higher than with other bonds.

Resins for Brake Linings

Both woven and molded brake linings are processed with BAKELITE Resin for greater toughness, dimensional stability, and resistance to wear and heat.

Physical Properties of SURFACE COATINGS *made with "Bakelite" Resins*

BAKELITE Synthetic Resins, when formulated into protective coatings, provide such properties as durability, faster drying speed, toughness, hardness or flexibility, resistance to wear and abrasion, and resistance to water and chemicals.

Phenolic Resins

For fortifying paints, primers, varnishes, and enamels of all types. Outstanding are the para-phenyl-phenol type of resins BR-17000 and BR-254, which have established new standards of durability for government and industrial specification coatings. Numerous other BAKELITE Phenolic Resins are serving widely diversified coating requirements. Certain types are used to fortify non phenolic coatings to improve performance.

Dispersion Resins

These resins provide coatings with an unusual combination of properties—extremely fast drying time and maximum resistance to moisture. Such coatings dry as fast as *one minute*, entirely by solvent evaporation, without need of baking treatment. Because they are non-oxidizing, they do not become brittle after long years of service. They are especially useful as primers for ferrous and non-ferrous metals, particularly aluminum and magnesium alloys.

Baking Resins

For hard, abrasion-resistant coatings for lining cans, drums, and tanks. Baked on immediately after application, they provide high resistance to heat, chemicals, and moisture. Equipment need not be dismantled nor shipped out of the plant; the coatings can be applied, *right on the job*, by means of special, portable baking apparatus.

C-9 Resins

For coatings on cloth, paper, concrete, plaster, brick, plastics, wood, and metal, these versatile resins contribute many unusual physical properties. They are noted for their adhesion and long retention of flexibility. In wet scrub tests, water-emulsion paints made with them far exceed durability required in government specifications. Baking enamels based on them do not blister or flake even when immediately plunged into cold water after long baking.

Physical Properties of "Bakelite" IMPREGNATING, SEALING, and CALENDERING MATERIALS

Calendering Resins for Cloth

Cloth calendered with BAKELITE Resins gains added toughness with little or no sacrifice in flexibility. The resins impart a high order of resistance to water, chemicals, and heat.

Resins for Wood Densifying and Stabilizing

The many important advantages of wood are supplemented by high mechanical strength and excellent resistance properties when impregnated with BAKELITE Resins. In particular, the moisture content of wood veneers can be stabilized by such treatment. Impregnated veneers can be compressed into densified wood, known as "compreg," with specific gravity up to 1.37. On parallel-grained specimens, modulus of rupture can reach 38,000 pounds per square inch (with grain), and compressive strength 25,000 pounds per square inch (with grain). "Compreg" is fire retardant, has excellent aging properties, and is resistant to sulphuric and hydrochloric acid solutions.

Sealing Solutions for Castings

Castings ordinarily rejected for porosity and small blowholes are reclaimed by forcing BAKELITE Sealing Solutions into the pores under pressure, and then baking. The sealing solution thus becomes exceedingly hard and tough, unaffected by hot or cold water, steam, oils, chemicals, or heat up to 400 deg. F.

Impregnating Varnishes for Windings

As protective coatings and insulating bonds for coils, armatures, and windings, BAKELITE Varnishes remain stable and hard despite elevated operating temperatures and high rotational speeds. Better mechanical strength is also obtained.

(*Continued from page* 202)

But people suffer injuries from such a variety of causes and in such a vaierty of ways and places that, whether he likes it or not, the safety man's nose is in almost everybody else's business.

To correct those injury causes, it's essential that he apply the best thinking available whether it is his or someone else's and, if it's someone else's, so much the better. He has enlisted a partner in his war on accidents and if he is smart he'll see that the partner gets the credit for doing the job and is thus sold the idea of responsibility for looking out for safety in his own field.

Those pipelines I mentioned can be used for pumping out as well as for siphoning in. The chemist who helps you lick a chemical problem can be sold enough of the safety attitude to cause him to check on the toxicity of a chemical he is about to introduce into the plant process. The civil engineer who helps you on a drainage problem can be sold enough safety that he'll leave proper clearance on the next track he lays out and will remember to think about the truck drivers' line of vision when he puts in the crossing. The plant publication editor who helps on a safety story can be sold the necessity for remembering safety in every story he writes.

There is one more point. You can't be everywhere all of the time and you can't know everything that is going on. So, unless you make yourself some volunteer helpers who have been sold on their responsibility for safety, the job will be done only when you are there to do it. And that won't be in enough places or at enough times.

Improvement in the Electrolytic Tin-Plating Process

A large reduction in the amount of tin required for tin plate is expected from the application of high-frequency heating of tin electrolytically deposited on sheet steel. Electrolytically-deposited tin forms a granular dull-gray surface which is not highly corrosion-resistant. To improve the corrosion resistance, the tin must be fused to cause it to flow and form a coating of uniform thickness. At present fusing of the tin coating is effected in gas furnaces or over vats of hot oil, but one sheet mill has put in equipment for heating the sheet by the high-frequency electric-induction system. Steel sheet coated by the electrolytic process has a coat of tin 0.00003 in. thick on each side, as compared with a coating of three times that thickness obtained by the hot-dipping process. In addition to increasing the corrosion-resistance of the tin plate, the smooth surface obtained by flowing the tin improves the handling qualities in press operations. At present high-frequency heating equipment is being designed for heating and flowing the tin which will permit of an operating speed of 1000 fpm, while gas furnaces are limited to 150 fpm and hot-oil baths to 200 fpm.

The frequency which permits of the required current being induced in the strip without the use of abnormally high voltages depends on the thickness of the stock. Since tin plate usually ranges between 0.008 and 0.011 in. in thickness, a frequency of about 200,000 cycles per second has been found most practical. The inductor heater coil is rectangular in form and is wound as close to the strip as possible. It acts as the primary of a transformer, while the strip itself forms a single-turn secondary. The induced current flows across the strip, paralleling the turns of the inductor heater coil.

Power is supplied by vacuum-tube oscillators, which are essentially radio transmitters. Sixty-cycle alternating current is rectified and fed to the oscillator tubes, where it is converted to 200,000-cycle alternating current and sent through the inductor heater coil. According to Westinghouse Electric & Manufacturing Co., one plant is installing tin-flowing oscillator units having 72 times the power of the most powerful broadcasting station.

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Awards

(*Continued from page 167*)

ENGINEERING & RESEARCH Corp., Riverdale, Md.
EQUINOX MILLS, Anderson, S. C.
ERICSSON Co., Henry, Great Lakes, Ill.
ERIE CITY Iron Works, Erie, Pa.
ERIE PROVING GROUND, La Carne, Ohio.
ESTATE STOVE Co., Hamilton, Ohio.
EUREKA VACUUM Cleaner Co., Gas Mask Div., Detroit, Mich.
EVANS CONSTRUCTION Co., and Manhattan Construction Co., Camp Chaffee, Ark.
EX-CELLO-O Corp., Detroit, Mich.
EXPOSITION COTTON MILLS Co., Atlanta, Ga.
FAFNIR BEARING Co., New Britain, Conn.
FAICHNEY INSTRUMENT Corp., Watertown, N. Y.
FAIRBANKS, Morse & Co., Beloit, Wis., Freeport, Ill., Three Rivers, Mich.
FAIRCHILD AVIATION Corp., Jamaica, N. Y.
FAIRCHILD ENGINE & Airplane Corp., Hagerstown, Md.
FAIRFOREST FINISHING Co., Clevedale, S. C.
FAIR HAVEN YACHT Works, Fair Haven,, N. J.
FARNSWORTH TELEVISION & Radio Corp., Marion, Ind.
FARQUHAR Co., Ltd., A. B., York, Pa.
FARRELL-CHEEK Steel Co., Sandusky, Ohio.
FEDERAL MFG. & Engineering Corp., Brooklyn, N. Y.
FEDERAL MOTOR TRUCK Co. Detroit, Mich.
FEDERAL PRODUCTS Corp., Providence, R. I.
FEDERAL SCREW Works, Plant No. 4, Chelsea, Mich.
FEDERAL SHIPBUILDING & Dry Dock Co., Kearny, N. J.
FELLOWS GEAR Shaper Co., Springfield, Vt.
FELTERS Co., Inc., Millbury, Mass.
FERGUSON & Son, F., Hoboken, N. J.
FERRIS INSTRUMENT Corp., Boonton, N. J.
FERRO ENAMEL Corp., Cleveland, Ohio.
FIDELITY MACHINE Co., Philadelphia, Pa.
FIELD & FLINT Co., Brockton, Mass.
FIRESTONE RCBBER & Latex Products Co., Fall River, Mass.
FIRESTONE TIRE & Rubber Co., Akron, Ohio.
FISCHER & Co., H. G., Chicago, Ill.
FLANNERY BOLT Co., Bridgeville, Pa.
FLEETWINGS, INC., Bristol, Pa.
FLEETWOOD CRAFTSMEN, Inc., Fleetwood, Pa.
FOLMER GRAFLEX Corp., Rochester, N. Y.
FOOD MACHINERY Corp., Lakeland, Fla.
FOOTE BROTHERS GEAR & Machine Corp., Precision Gear Div., Chicago, Ill.
FOOTE-PIERSON Co., Newark, N. J.
FORD, BACON & DAVIS, Inc., Jacksonville, Ark.
FORD MOTOR Co., Chester, Pa., Dearborn, Mich. & Aircraft Engine Div., Detroit, Mich.
FORMICA INSULATION Co., Cincinnati, Ohio.
FOSDICK MACHINE Tool Co., Cincinnati, Ohio.
FOSTER WHEELER Corp., Dansville, N. Y.
FOSTORIA SCREW Co., Fostoria, Ohio.
FRANKFORD ARSENAL, Philadelphia, Pa.
FREEPORT POINT Shipyard, Inc., Freeport, N. Y.
FREETO CONSTRUCTION Co., and F. H. McGraw & Co., Baxter Springs, Kan.
FRETZ & SONS, William F., Bedminster & Pipersville, Pa.
FROEHLICH Co., Inc., S., New York, N. Y.
FULTON SYLPHON Co., Knoxville, Tenn.
GADSDEN ORDNANCE Plant, Gadsden, Ala.
GALANOT PRODUCTS Co., Alliance, O.
GALEDE DYEING Co., Inc., Paterson, N. J.
GALVIN MFG. Co., Chicago, Ill.
GARY PLANER Co., G. A., Cincinnati.
GARY STEEL Products Corp., Norfolk, Va.
GENERAL CABLE Corp., Perth Amboy, N. J. & Rome, N. Y.
GENERAL ELECTRIC Co., Ontario, Pittsfield, Mass., San Bernardino County, Calif., Schenectady, N. Y.
GENERAL ELECTRIC X-RAY Corp., Chicago, Ill.
GENERAL MACHINERY Corp., Hamilton, Ohio & Lakeland, Fla.
GENERAL MACHINERY ORDNANCE Corp., (U. S. Navy Ordnance Plant), South Charleston, W. Va.
GENERAL MOTORS Corp.
- AC Spark Plug Div., Flint, Mich.
- Allison Div., Indianapolis, Ind.
- Cadillac Motor Car Div., Detroit, Mich.
- Chevrolet Gear & Axle Div., Detroit, Mich.
- Chevrolet Gear & Axle Div., Detroit.
- Delco Products Div., Dayton, Ohio.
- Electro-Motive Div., La Grange, Ill.
- Fisher Body Div., Flint, Mich.
- Fisher Tank Arsenal, Grand Blanc, Mich.
- Frigidaire Ordnance Plant, Dayton, Ohio.
- Guide Lamp Div., Anderson, Ind.
- Hyatt Div., Harrison, N. J.
- New Departrue Oiv., Bristol, & Meriden, Conn.
- Oldsmobile Div., Lansing, Mich.
- Packard Electric Div., Warren, Ohio.
- Pontiac Div., Pontiac, Mich.
- Proving Ground, Milford, Mich.
- Saginaw Steering Gear Div., Saginaw, Mich., and plant at Rochester, N. Y.

(*Turn to page 210, please*)

Why we work against Inspectors

The inspector maintains quality by finding and throwing out substandard parts. **HECKER's** job is to help make subquality hard to find. We'd be the last to say that better tools, **HECKER** tools, make the inspector's job easier. But we do know that our tools have minimized rejects in many well-known plants.

In *designing and building* tools **HECKER** engineers work with firsthand knowledge of production problems. They know the men and machines of our many regular customers. They know the production problems of our own operations on close-tolerance parts for aircraft. Their extra know-how comes from the production floor where the problems are.

Your big problem may be to speed up your output per machine. Or, it may be reduction of rejects. Or both. Whatever it is, let us demonstrate **HECKER** service on your meanest tooling problem. Write A. W. Hecker, 1984 East 66th Street, Cleveland, Ohio, or 517 New Center Building, Detroit, Michigan.

A·W· Hecker

DESIGNERS AND BUILDERS OF TOOLS, JIGS AND FIXTURES . . . FABRICATORS OF AIRCRAFT PARTS

Army Navy "E" Awards

(Continued from page 208)

GENERAL POWER, Inc., Rochester, N. Y. & Quapaw, Okla.
GENERAL RADIO Co., Cambridge, Mass.
GENERAL STEEL CASTINGS Corp., Eddystone, Pa. & Granite City, Ill.
GERSTEIN & COOPER Co., South Boston, Mass.
GERWICK, Inc., Ben C., Oakland, Calif.
GIDDINGS & LEWIS Machine Tool Co., Fond du Lac, Wis.
GILBERT & BARKER Mfg. Co., West Springfield, Mass.
GILFILLAN BROTHERS, Inc., Los Angeles, Calif.
GISHOLT MACHINE Co., Madison, Wis.
GLAMORGAN PIPE & FOUNDRY Co., Lynchburg, Va.
GLEASON Works, Rochester, N. Y.
GLOBE KNITTING WORKS, Grand Rapids, Mich.
GODDARD & GODDARD Co., Inc., Detroit, Mich.
GONIC Mfg. Co., Gonic, N. H.
GOODRICH Co., B. F., Akron, Ohio, Louisville, Ken., Niagara Falls, N. Y Hood Rubber Co., Watertown, Mass.
GOODYEAR ENGINEERING Corp., Charlestown, Ind.
GOOODYEAR TIRE & Rubber Co., Plant No. 3, Akron, Ohio.
GORTON MACHINE Co., George, Racine, Wis.
GOSLIN-BIRMINGHAM Mfg. Co., Birmingham, Ala.
GRANITE CITY STEEL Co., Granite City, Ill.
GRAVES, Inc., James E., Marblehead, Mass.
GRAY MARINE MOTOR Co., Diesel Engine Plant, Gasoline Engine Plant & Shipping Div., Detroit, Mich.
GRAY PLANER Co., G. A., Cincinnati, Ohio.
GREENFIELD TAP & Die Corp., Greenfield, Mass.
GREENLEE BROTHERS & Co., Rockford, Ill.
GREIST MFG. Co., New Haven, Conn.
GRIMES MFG. Co., Urbana, Ohio (Plant 1)
GUNDLACH MFG. Co., Fairport, N. Y.
GURLEY, W. & L. E., Troy, N. Y.
HAINES GAUGE Co., Philadelphia, Pa.
HALLICRAFTERS Co., Chicago, Ill.
HALL-SCOTT MOTOR Co., Berkeley, Calif.
HAMMERMILL PAPER Co., Erie, Pa.
HAMPSHIRE WOOLEN Co. & Ware Woolen Co., Ware, Mass.
HANDY & HARMAN Co., Bridgeport, Conn.
HANES KNITTING Co., P. H., Winston-Salem, N. C.
HANSON-WHITNEY MACHINE Co., Hartford, Conn.
HARMON CONSTRUCTION Co., and Cowen-Norten Construction Co., and Tankersley Construction Co., (Naval Reserve Aviation Base), Norman, Okla.
HARNISCHFEGER Corp., Milwaukee, Wis.
HARPER Co., H. M., Chicago, Ill.
HARRINGTON & RICHARDSON Arms Co., Worcester, Mass.
HARRISBURG STEEL Corp., Harrisburg, Pa.
HARVEY & SON, Guy P., Leominster, Mass.
HAYES INDUSTRIES, Jackson, Mich.
HEALD MACHINE CO., Worcester, Mass.
HEINTZ MFG. Co., Philadelphia, Pa.
HELLWIG SILK DYEING Co., Philadelphia, Pa.
HENDRICK Mfg. Co., Carbondale, Pa.
HENDY IRON Works, Joshua, Sunnyvale, Calif., Plant No. 2.
HEPPENSTALL Co., Bridgeport, Conn.
HERCULES MOTORS Corp., Canton, Ohio.
HERCULES POWDER Co., Kenvil, N. J., Parlin, N. J., Radford, Va.
HERSHEY CHOCOLATE Corp., Hershey, Pa.
HIGGINS INDUSTRIES, Inc., New Orleans, La.
HIGH STANDARD Mfg. Co., New Haven, Conn.
HILTON-DAVIS CHEMICAL Co., Cincinnati, Ohio.
HINSON Mfg. Co., Waterloo, Iowa.
HOBART BROTHERS Co., Troy, Ohio.
HOBART MFG. Co., Troy, Ohio.
HOE & Co., Inc., R., Bronx, N. Y.
HOLABIRD & ROOT, Marion Ohio and Hunkin-Conkey Construction Co., Marion, Ohio.
HOMELITE Corp., Port Chester, N. Y.
HOOKER ELECTRO-CHEMICAL Co., Niagara Falls, N. Y.
HOOVER Co., North Canton, Ohio.
HORNI SIGNAL Mfg. Corp., New York, N. Y.
HORTON Mfg. Co., Fort Wayne, Ind.
HOSDREG Co., Inc., Huntington, Ind.
HOWARD & FOSTER, Inc., Brockton, Mass.
HOWARD FOUNDRY Co., Chicago, Ill.
HUBBARD & Co., Emeryville, Calif.
HUDSON MOTOR CARCO., Detroit, Mich.
HUMBLE OIL & Refining Co., Baytown, Tex.
HUNKIN-CONKEY Construction Co., Marion, Ohio & Cliff Park Village, Ohio and Holabird & Root, Marion, Ohio.
HUNTSVILLE CHEMICAL Warfare Arsenal, Huntsville, Ala.
HUSSMAN-LIGONIER Co., St. Louis, Mo.
HYDE & SONS Co., A. R., Cambridge, Mass.
HYDE WINDLASS Co., Bath, Maine.
I-T-E CIRCUIT BREAKER Co., Philadelphia, Pa.
ILEX OPTICAL Co., Rochester, N. Y.

Army-Navy "E" Awards

ILG ELECTRIC Ventilating Co., Chicago, Ill.
ILLINOIS GEAR & Machine Co., Chicago, Ill.
ILLINOIS TOOL Works, Chicago, Ill.
INDEPENDENT LOCK Co., Fitchburg, Mass.
INDEPENDENT PNEUMATIC Tool Co., Aurora, Ill.
INDIUM Corp. of America, Utica, N. Y.
INDUSTRIAL TOOL & Die Works, Inc., St. Paul, Minn.
INGERSOLL-RAND Co., Athens, Pa., Painted Post, N. Y., Phillipsburg, N. J.
INGRAM-RICHARDSON Mfg. Co., Beaver Falls, Pa.
INLAND STEEL Co., Indiana Harbor, Ind.
INSPIRATION CONSOLIDATED Copper Co., Inspiration, Ariz.
INTERNATIONAL BUSINESS Machines Corp., Plant No. 1, Endicott, N. Y.
INTERNATIONAL HARVESTER Co., Tractor Works & West Pullman Works, Chicago, Ill., St. Paul, Minn., Milwaukee, Wis.
INTERNATIONAL NICKEL Co., Inc., Huntington, W. Va.
INTERNATIONAL REGISTER Co., Chicago, Ill.
INTERNATIONAL RESISTANCE Co., Philadelphia, Pa.
INTERNATIONAL SMELTING & Refining Co., Miami, Ariz.
IOWA TRANSMISSION Co., Waterloo, Iowa.
IRVING SUBWAY Grating Co., Long Island City, N. Y.
JACOB, Inc., Robert, City Island, N. Y.
JACOBS Co., F. L., Dearborn, Mich., Detroit, Mich.
JACOBSON & Co., Inc., New York, N. Y.
JAMES MFG. Co., D. O., Chicago, Ill.
JAM HANDY Organization, Detroit, Mich.
JEFFERSON PROVING GROUND, Madison, Ind.
JEFFERSONVILLE QUARTERMASTER Depot, Jeffersonville, Ind.
JELLIFF Mfg. Corp., C. O., Southport, Conn.
JENKINS BROTHERS, Inc., Bridgeport, Conn.
JESSOP STEEL Co., Washington, Pa.
JOHNS-MANVILLE Corp., New York, N. Y., Manville, N. J.
JOHNSON & JOHNSON Gas Mask Div., Chicago, Ill.
JOHNSON MOTORS, Waukegan, Ill.
JOHNSON STEEL & Wire Co., Worcester, Mass.
JONES CONSTRUCTION Co., J. A., Hoffman, N. C.
JONES & LAMSON Machine Co., Springfield, Vt.
JONES & LAUGHLIN Steel Corp., Aliquippa, Pa.
KALTENBACH Corp. & Wellman Engineering Corp., Cleveland, Ohio.
KANSAS CITY STRUCTURAL Steel Co., Kansas City, Kan.
KAYDON ENGINEERING Corp., Muskegon, Mich.
KEARNEY & TRECKER Corp., Milwaukee, Wis.
KELLOGG Co., Battle Creek, Mich.
KELSEY-HAYES Wheel Co., Detroit, Lansing, Plymouth, Mich.
KEMP MFG. Co., C. M., Baltimore, Md.
KENDALL Co., Bauer & Black Div., Chicago, Ill.
KENNECOTT COPPER Corp.
Nevada Consolidated Copper Co., Ray, Ariz.
Utah Copper Co., Bingham Canyon, Utah.
KENNECOTT WIRE & Cable Co., Phillipsdale, R. I.
KENT MFG. Co., Clifton Heights, Pa.
KEOKUK Electro-Metals Co., Keokuk, Iowa.
KEYSTONE TRAILER & Equipment Co., Kansas City, Mo.
KILGORE MFG. Co., International Flare Signal Div., Tipp City, Ohio, Westerville, Ohio.
KING & SON, James, Staten Island, N. Y.
KINGSBURY MACHINE Works, Inc., Philadelphia, Pa.
KINGSTON PRODUCTS Corp., Kokomo, Ind.
KOLLMORGEN OPTICAL Corp., Brooklyn, N. Y.
KOPPERS Co., American Hammered Piston Ring Div., Baltimore, Md.
KRAFT CHEESE CO., Decateur, Ind. & Green Bay, Wis.
KRASBERG & SONS Mfg. Co., R., Chicago, Ill.
LACKAWANNA LEATHER Co., Hackettstown, N. J.
LA-DEL CONVEYOR & Mfg. Co., New Philadelphia, Ohio.
LAKE STATE Products, Inc., Jackson, Mich.
LANDIS MACHINE Co., St. Louis, Mo.
LANDIS TOOL Co., Waynesboro, Pa.
LaPLANT CHOATE Co., Cedar Rapids, Iowa.
LAPOINTE MACHINE Co., Hudson, Mass.
LAPP INSULATOR Co., Le Roy, N. Y.
LEBANON WOOLEN Mills, Lebanon, Tenn.
Le BLOND MACHINE Tool Co., R. K., Cincinnati, Ohio.
LEECE-NEVILLE Co. (Two plants).
LEEDS & NORTHRUP Co., Philadelphia, Pa.
LELAND-GIFFORD Co., Worcester, Mass.
LEMPCO PRODUCTS, Inc., Bedford, Ohio.
LESLIE Co., Lyndhurst, N. J.

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Awards

(Continued from page 211)

Le TOURNEAU, Inc., Peoria, Ill.
LEVINGSTON SHIPBUILDING Co., Orange, Tex.
LIDERWOOD MFG. Co., Elizabeth, N. J.
LIGHTS, Inc., Alhambra, Calif.
LILLY & Co., Eli, Indianapolis, Ind.
LIMA LOCOMOTIVE Works, Lima, Ohio.
LINCOLN BLEACHERY & Dye Works, Lansdale, R. I.
LINCOLN ENGINEERING Co., St. Louis, Mo.
LINCOLN MILLS of Alabama, Huntsville, Ala.
LINCOLN PARK Tool & Gage Co., Lincoln Park, Mich.
LINDBERG ENGINEERING Co., Chicago, Ill.
LINDE AIR Products Co., Sapphire Plant, East Chicago, Ind.
LIPE-ROLLWAY Corp., Syracuse, N. Y.
LONE STAR Defense Corp., Lone Star Ordnance Plant, Texarkana, Tex.
LUCAS MACHINE Tool Co., Cleveland, Ohio.
LUNDQUIST TOOL & Mfg. Co., Worcester, Mass.
McCALLUM-HATCH Bronze Co., Inc., Buffalo, N. Y.
McCORD RADIATOR & Mfg. Co., Detroit, Mich.
McCULLOUGH, Inc., Eitel, San Bruno, Calif.
McDONALD Mfg. Co., Los Angeles, Calif.
McGRAW & Co., F. H., and Freeto Construction Co., Baxter Springs, Kan.
McLEAN CONTRACTING Co., Norfolk, Va.
M. B. MFG. Co., New Haven, Conn.
MACCO CONSTRUCTION Co., San Diego, Calif.
MACK MFG. Co., New Brunswick, N. J.
MACK MOLDING Co., Wayne, N. J.
MACWHYTE Co., Kenosha, Wis.
MAGMA COPPER Co., Superior, Ariz.
MAGNA MFG. Co., Inc., Plants 1 and 2, Haskell, N. J.
MAHONEY-TROAST Construction Co., Bayonne, N. J.
MALLORY & Co., Inc., P. R. Indianapolis, Ind.
MANHATTAN CONSTRUCTION Co., and S. E. Evans Construction Co., Camp Chaffee, Ark.
MANUFACTURERS MACHINE & Tool Co., Inc., New York, N. Y.
MANVILLE MFG. Co., Pontiac, Mich.
MARCHANT CALCULATING Machine Co., Oakland, Calif.
MARINE IRON & Shipbuilding Co., Baltimore, Md., & Duluth, Minn.
MARKEY MACHINERY Co., Inc., Seattle, Wash.
MARQUETTE METAL Products Co., Cleveland, Ohio.
MARTIN DYEING & Finishing Co., Bridgeton, N. J.
MARTIN-SCHWARTZ, Inc., Salisbury, Md.
MARYLAND DRYDOCK Co., Baltimore, Md.
MASLAND & SONS, C. H., Carlisle, Pa.
MASONITE Corp., Laurel, Miss.
MATAM Corp., New York, N. Y.
MATHEWS CONVEYOR Co., Ellwood City, Pa.
MATHEWS COTTON Mill, Greenwood, S. C.
MATHIESON ALKALI Works, Inc., Niagara Falls, N. Y.
MATSON NAVIGATION Co., Construction & Repair Dept., San Francisco, Calif.
MAXON CONSTRUCTION Co., Burns City, Ind.
MEISSNER MFG. Co., Mt. Carmel, Ill.
MERCK & Co., Inc., Elkton, N. J., Philadelphia, Pa., Rahway, N. J.
MERGENTHALER LINOTYPE Co., Brooklyn, N. Y.
MERGENTHALER & SON, J., New York, N. Y.
MESTA MACHINE Co., West Homestead, Pa.
METLAB Co., Philadelphia, Pa.
MIAMI COPPER Co., Miami, Ariz.
MIAMI SHIPBUILDING Corp., Miami, Fla.
MICHIGAN MAPLE Block Co., Petoskey, Mich.
MICHIGAN SEAMLESS Tube Co., South Lyon, Mich.
MICROMATIC HONE Corp., Detroit, Mich.
MIDDLESEX PAPER Tube Co., Burlington, N. J.
MID-STATE Mfg. Co., Waupun, Wis.
MID-WEST Mfg. Co., Galesburg, Ill.
MILBURN MILLS, Inc., New York, N. Y.
MILLER-PARROTT Baking Co., Terre Haute, Ind.
MILLER PRINTING Machinery Co., Pittsburgh, Pa.
MILWAUKEE SADDLERY Co., Milwaukee, Wis.
MINNEAPOLIS-HONEYWELL Regulator Co., South Minneapolis, Minn., & Wabash, Ind.
MISSOURI VALLEY Bridge & Iron Co., Leavenworth, Kan.
MITCHELL Co., John E., Dallas, Tex.
MOHAWK CARPET Mills, Inc., Amsterdam, N. Y.
MONITOR PIEZO Products Co., South Pasadena, Calif.
MONROE AUTO Equipment Co., Monroe, Mich.
MONROE STEEL Castings Co., Monroe, Mich.
MONSANTO CHEMICAL Co., Chemical Warfare Service & Organic Chemicals Div., Monsanto, Ill., & St. Louis, Mo.
MOORE Co., George C., Westerly, R. I.
MORLEY Co., Inc., Portsmouth, N. H.

(Turn to page 216, please)


SNAP GAGES?
We Can Ship Today!
Sheffield has a complete stock of AGD Adjustable Snap Gages in all models and in all ranges —for immediate shipment.
Every one of these gages has been made to Sheffield's high standards of quality in both materials and precision workmanship.
When Ordering, Be Sure to Give All the Following Information:
State Frame Model and Frame Size. Stipulate whether gage is to be set and sealed (allow additional day on orders for set and sealed gages). Give complete marking instructions if set and sealed.
FOR SPECIFICATIONS SEE SHEFFIELD HANDBOOK No. 42-2 PAGES 150-153
AGD MODEL A
AGD MODEL SB
AGD MODEL SC
AGD MODEL SMC
THE SHEFFIELD CORPORATION
DAYTON, OHIO, U. S. A.
SHEFFIELD GAGES
MASTER GAGEMAKERS

Awards

(Continued from page 214)

MORRISON BROTHERS Co., Dubuque, Iowa.
MOSER JEWEL Co., Perth Amboy, N. J.
MOUNT VERNON Die Casting Corp., Mount Vernon, N. Y.
MUNDT & SONS, Charles, Jersey City, N. J.
MUNSINGWEAR, Inc., Minneapolis, Minn.
MURRAY MFG. Co., Brooklyn, N. Y.
MURRAY OHIO Mfg. Co., Cleveland, Ohio.
NATIONAL AUTOMATIC Tool Co., Richmond, Ind.
NATIONAL BISCUIT Co., New York, N. Y.
NATIONAL BROACH & Machine Co., Detroit, Mich.
NATIONAL CARBON Co., Bennington, Vt., Clarksburg, W. Va.
NATIONAL ELECTRIC INSTRUMENT Co., Inc., Long Island, N. Y.
NATIONAL FIREWORKS, Inc., Elkton, Md., Memphis, Cordova, Tenn.
NATIONAL FORGE & Ordnance Co., Irvine, Pa.
NATIONAL MACHINE Products Co., Detroit, Mich.
NATIONAL MACHINERY Co., Tiffin, O.
NATIONAL MAGNESIUM Corp., Elkton, Md.
NATIONAL MUNITIONS Corp., Carrboro, N. C.
NATIONAL PNEUMATIC Co., Rahway, N. J.
NATIONAL STANDARD Co., Athenia Steel Co., Clifton, N. J.
NATIONAL SUPPLY Co., Pittsburgh, Pa., Toledo, O.
NATIONAL TOOL Co., Cleveland, Ohio.
NATIONAL TUBE Co., McKeesport, Pa.
NATIONAL TWIST DRILL & Tool Co., Detroit, Mich.
NATIONAL WIRE DIE Co., New York, N. Y.
NATIONAL ZINK Co., Bartlesville, Okla.
NAVAL AMMUNITION Depot, Fort Mifflin, Pa.
NAVAL AMMUNITION Depot, Hawthorne, Nev.
NAVAL AMMUNITION Depot, Iona Island, N. Y.
NAVY YARD, Charleston, S. C.
NAVY YARD, Pearl Harbor, T. H.
NAVY YARD, Portsmouth, N. H.
NAVY YARD, Puget Sound, Wash.
NEIL CO., Ltd., Wm. P., Naval Ammunition Depot, Hawthorne, Nev.
NEVINS, INC., Henry B., City Island, N. Y.
NEW BRITAIN MACHINE Co., New Britain, Conn.
NEW PROCESS GEAR Co., Syracuse, N. Y.
NEWMAN COTTON MILLS, Newman, Ga.
NICHOLS & SONS, W. H., Waltham, Mass.
NILES BEMENT-Pond Co., Pratt & Whitney Div., West Hartford, Conn.
NORDEN, Inc., Carl L.
NORRIS MANUFACTURER, Inc., W. C., Tulsa, Okla.
NORRIS STAMPING & Mfg. Co., Los Angeles, Calif.
NORTH AMERICAN AVIATION, Inc., Dallas, Texas, Inglewood, Calif.
NORTHERN ENGRAVING & Mfg. Co., La Crosse, Wis.
NORWALK Co., Inc., South Norwalk, Conn.
OCEAN CITY Mfg. Co., Philadelphia, Pa.
O'CONNOR MACHINE Co., Sheffield, Pa.
OHIO INJECTOR Co., Wadsworth, Ohio.
OHIO LOCOMOTIVE Crane Co., Bucyrus, Ohio.
OHIO STEEL Foundry Co., Lima, Ohio, Springfield, Ohio.
OIL WELL Supply Co., Oil City, Pa.
OKONITE Co., Hazard Insulated Wire Works, Wilkes-Barre, Pa.
OLDBURY ELECTRO-Chemical Co., Niagara Falls, N. Y.
OMAHA STEEL Works, Omaha, Neb.
ONEIDA Limited, Oneida, N. Y.
OREGON BRASS Works, Portland, Ore.
ORITSKY Co., Herman D., Reading, Pa.
OSGOOD Co., Marion, Ohio.
OTIS ELEVATOR Co., Buffalo, N. Y., Harrison, N. J.
OUTERS LABORATORIES, Onalaska, Wis.
OWATONNA TOOL Co., Owatonna, Minn.
OWENS-CORNING Fiberglas Corp., Ashton, R. I., Newark, Ohio.
PACIFIC BRIDGE Co., Navy Yard, Pearl Harbor, T. H.
PACIFIC MILLS, Lawrence, Mass.
PACKARD Mfg. Co., Indianapolis, Ind.
PACOLET Mfg. Co., New Holland, Ga.
PALMER SCOTT & Co., Inc., New Bedford, Mass.
PANISH CONTROLS, Bridgeport, Conn.
PARCOLET Mfg. Co., New Holland, Ga.
PARISH PRESSED STEEL Co., Reading, Pa.
PARK, DAVIS & Co., Detroit, Mich.
PAUSIN ENGINEERING Co., Newark, N. J.
PECO Mfg. Co., Philadelphia, Pa.
PENN ELECTRIC SWITCH Co., Inc., Goshen, Ind.
PERFECTION STEEL Body Co., Galion, Ohio.
PHELPS DODGE Copper Products Corp., Bayway, N. J., Yonkers, N. Y., Fort Wayne, Ind.
PHELPS DODGE CORP., Morenci, Jerome and Ajo, Ariz.
PHILADELPHIA INSULATED WIRE Co., Philadelphia, Pa.
PHILADELPHIA QUARTERMASTER Depot, Philadelphia, Pa.
PHILADELPHIA TEXTILE Finishers, Inc., Philadelphia, Pa.
PHILCO Corp., Philadelphia, Pa.
Simplex Radio Corp., Sandusky, Ohio.
Storage Battery Div., Chicago, Ill.

(Turn to page 220, please)

Important Notice to War Plants Concerning Por-os-way Deliveries

WE MUST BE FRANK. When we first announced the Por-os-way precision grinding wheel a little more than a year ago, we were ready with a plant far exceeding our previous one in size, equipment and man-power. It was, we felt, big enough to meet all demands. But two things have happened. First, the war. Then Por-os-way, making good its promise to increase grinding production 2 to 5 times per man per machine, has literally sky-rocketed in demand. Hundreds of grinder foremen and grinding machine operators want to prove Por-os-way can up production 2 to 5 times for them, want to see what makes it different from other wheels, how its cool action practically eliminates burning, how it takes cuts double or more than previous wheels and grinds in fewer passes, how it can cut faster producing an even *better finish using a finer grain*, why it resists loading, holds its corner, reduces dressings necessary.

ORDERS INCREASED 700%

Orders have poured in. Not at a steady pace but at an ever increasing rate. Our production is now forging ahead—yet is still not enough to satisfy the full demand for Por-os-way.

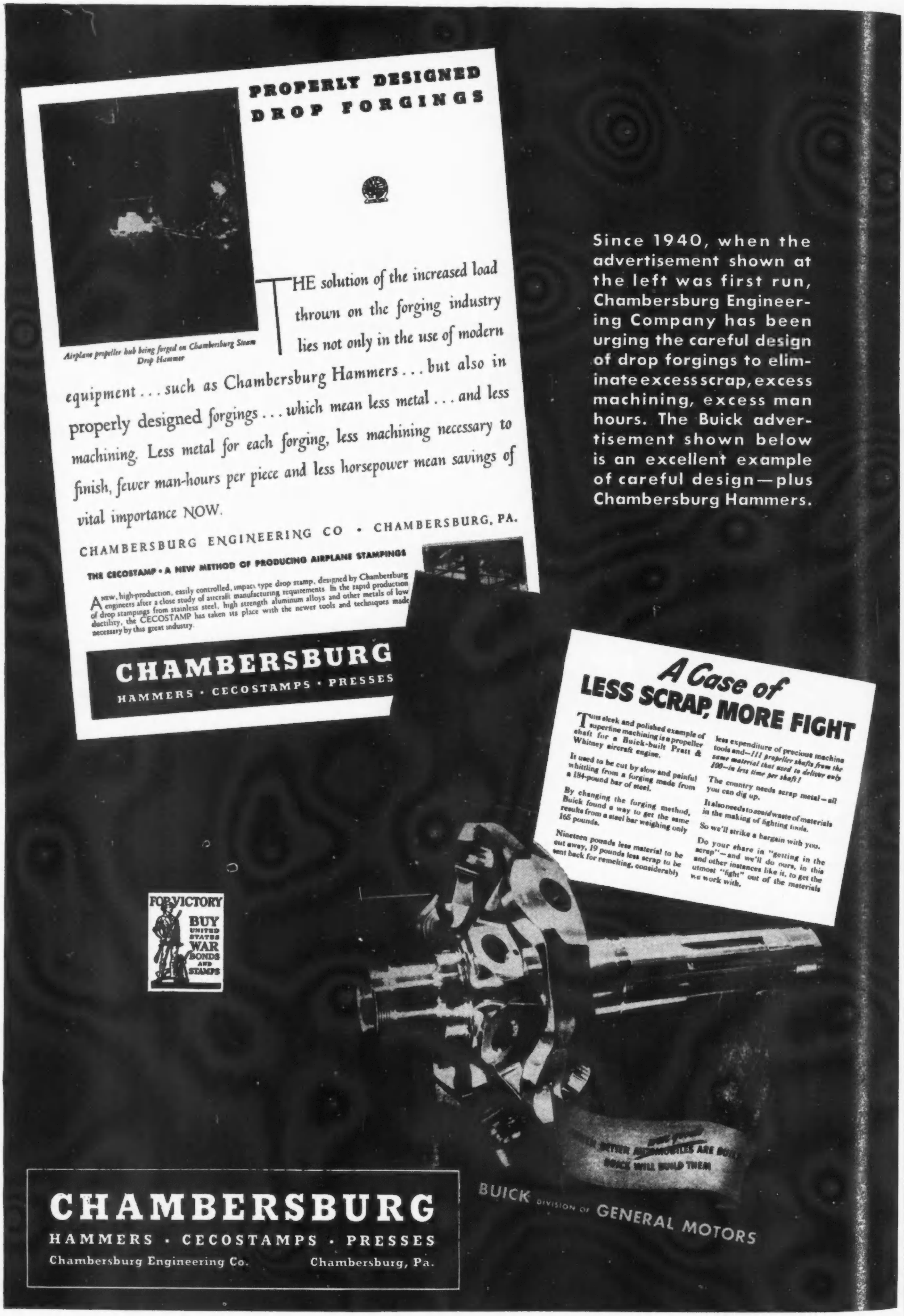
RELIEF IS IN SIGHT

Working 'round the clock was not enough. We needed more plant, more equipment, more men. Work on expanding our facilities is now completed. Greatly increased production is now under way. Again we believe it will be amply big enough to take care of all your demands. Naturally we want every war plant to know the exceptional advantages of Por-os-way wheels. And so, we're doing all we humanly can to keep up on delivery. In the meantime, write A. P. de Sanno & Son, Inc., 466 Wheatland Street, Phoenixville, Penna. for a booklet "Facts About Por-os-way". It gives a complete story.

POR-OS-WAY*
a new
RADIAC* PRODUCT

A. P. DE SANNO & SON, INC.
NEW YORK, CHICAGO, PITTSBURGH, CLEVELAND, DETROIT, LOS ANGELES

PHOENIXVILLE, PENNA.
Western Gateway to VALLEY FORGE


PROPERLY DESIGNED
DROP FORGINGS
Airplane propeller hub being forged on Chambersburg Steam Drop Hammer
THE solution of the increased load thrown on the forging industry lies not only in the use of modern equipment . . . such as Chambersburg Hammers . . . but also in properly designed forgings . . . which mean less metal . . . and less machining. Less metal for each forging, less machining necessary to finish, fewer man-hours per piece and less horsepower mean savings of vital importance NOW.
CHAMBERSBURG ENGINEERING CO • CHAMBERSBURG, PA.
THE CECOSTAMP • A NEW METHOD OF PRODUCING AIRPLANE STAMPINGS
A new, high-production, easily controlled, impact type drop stamp, designed by Chambersburg engineers after a close study of aircraft manufacturing requirements. In the rapid production of drop stampings from stainless steel, high strength aluminum alloys and other metals of low ductility, the CECOSTAMP has taken its place with the newer tools and techniques made necessary by this great industry.
CHAMBERSBURG
HAMMERS • CECOSTAMPS • PRESSES
Since 1940, when the advertisement shown at the left was first run, Chambersburg Engineering Company has been urging the careful design of drop forgings to eliminate excess scrap, excess machining, excess man hours. The Buick advertisement shown below is an excellent example of careful design—plus Chambersburg Hammers.
A Case of
LESS SCRAP, MORE FIGHT
This sleek and polished example of superfine machining is a propeller shaft for a Buick-built Pratt & Whitney aircraft engine.
It used to be cut by slow and painful whittling from a forging made from a 184-pound bar of steel.
By changing the forging method, Buick found a way to get the same results from a steel bar weighing only 165 pounds.
Nineteen pounds less material to be cut away, 19 pounds less scrap to be sent back for remelting, considerably less expenditure of precious machine tools and—111 propeller shafts from the same material that used to deliver only 100—in less time per shaft!
The country needs scrap metal—all you can dig up.
It also needs to avoid waste of materials in the making of fighting tools.
So we'll strike a bargain with you.
Do your share in "getting in the scrap"—and we'll do ours, in this and other instances like it, to get the utmost "fight" out of the materials we work with.
FOR VICTORY
BUY
UNITED STATES
WAR
BONDS
AND
STAMPS
BUICK DIVISION OF GENERAL MOTORS
CHAMBERSBURG
HAMMERS • CECOSTAMPS • PRESSES
Chambersburg Engineering Co.
Chambersburg, Pa.

BOMBER ON THE "Night Shift"

Out of the midnight sky swoops a four-motored thunderbird – an American bomber returning to its base after a raid deep into enemy territory.

Suddenly, from giant wings, twin beams of light probe earthward. The landing field becomes clearly defined.

Motors off now. Propellers swishing. A long glide and a smooth balanced landing. And another mission is safely completed.

* * * * *

To equip American bombers and fighting planes with landing, signal and instrument lighting of maximum efficiency – particularly for duty on the "night shift" – is part of E. A. Laboratories' wartime responsibility. It's a job we handle with pride. A job we are *able* to handle largely because of our long experience in the making of automotive equipment and accessories.

Tomorrow, after V-day, we will again supply the motor and aviation industry with better-than-ever E. A. products. But today E. A. management and employees are concentrating with grim singleness of purpose on war production and *more* production for the armed forces who will win the final victory.

J. J. McAufien

E. A. LABORATORIES, Inc., BROOKLYN, N. Y.

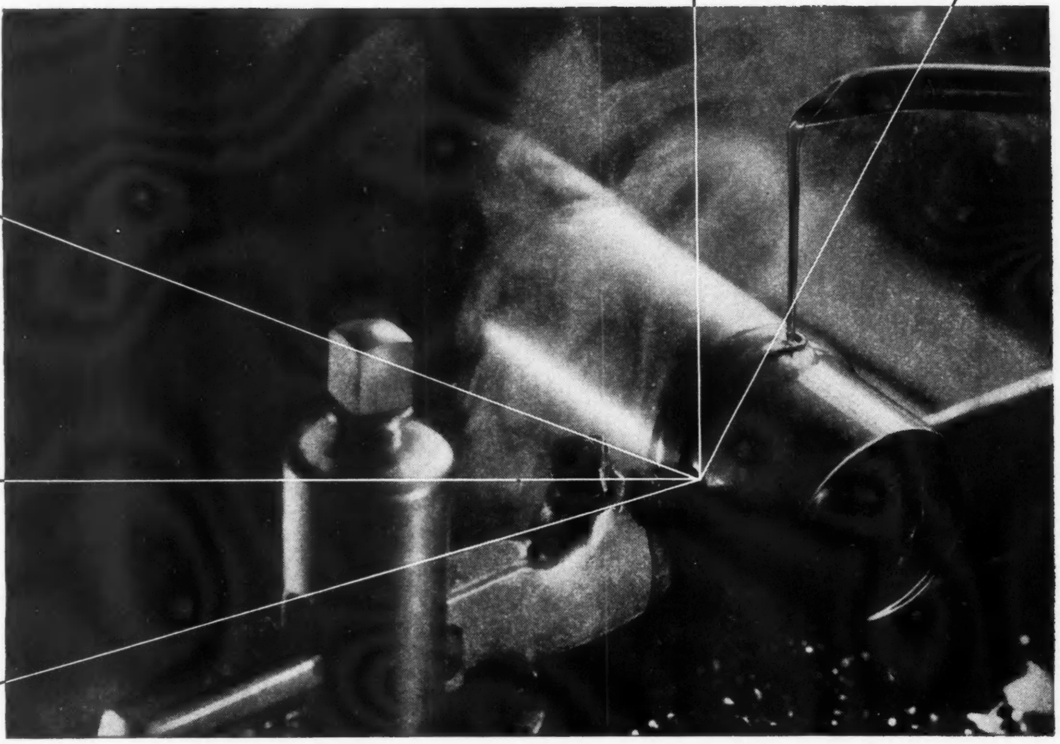
Awards

(Continued from page 216)

PHILLIPS-JONES Corp., Barnesboro, Pa.
PICTATINNY ARSENAL, Dover, N. J.
PICKER X-RAY Corp., Cleveland, Ohio.
PIDGEON THOMAS Iron Co., Memphis, Tenn.
PILLSBURY FLOUR Mills Co., Springfield, Ill.
PIONEER PARACHUTE Co., Manchester, Conn.
PIPE MACHINERY Co., Cleveland, Ohio.
PITNEY-BOWES Postage Meter Co., Stamford, Conn.
PITTSBURGH COKE & Iron Co., Pittsburgh, Pa.
PITTSBURGH FORGINGS Co., Coraopolis, Pa.
PITTSBURGH STEEL Co., Allenport, Pa., Monessen, Pa.
POIRIER & McLANE Corp., Cauldwell-Wingate Co., Orangeburg, N. Y.
POLK SMARTT Paving Co., Millington, Tenn.
POLLACK Co., George, Guy F. Atkinson Co., San Pedro, Calif.
PORCELAIN METALS Corp., Louisville, Ky.
PORTER & Co., H. K., Pittsburgh, Pa., Everett, Mass.
PORTLAND FORGE & FOUNDRY Co., Portland, Ind.
PORTLAND WOOLEN MILLS, Inc., Portland, Ore.
POULSEN & NARDON, Inc., Los Angeles, Cal.
POWERS & Co., Philadelphia, Pa., Chicago, River Forest, Ill.
PRATT & LETCHWORTH Co., Inc., Buffalo, N. Y.
PRESSED STEEL CAR Co., Chicago, Ill., McKees Rocks, Pa.
PROCTER & GAMBLE Defense Corp., Milan, Tenn.
PROVING CENTER, Aberdeen Proving Ground, Aberdeen, Md.
PULLMAN STANDARD CAR Mfg. Co., Hammond, Ind., Butler, Pa.
PUMP ENGINEERING Service Corp., Cleveland.
PUTNAM TOOL Co., Detroit, Mich.
QUEEN CITY STEEL TREATING Co., Cincinnati, O.
QUINCY BARGE Builders, Quincy, Ill.
RCA Mfg. C., Harrison, N. J.
R.T.C. Shipbuilding Corp., Camden, N. J.
RADIO RECEPTOR CO., Inc., New York, N. Y.
RADIOMARINE Corp. of America, N. Y.
RANCO, Inc., Columbus, O.
RAYBESTOS-MANHATTAN, Inc.
GENERAL ASBESTOS & RUBBER Div., North Charleston, S. C.
READ & LOVETT Mfg. Co., Weatherby, Pa.
REDSTONE ORDNANCE Plant, Huntsville, Ala.
REED-PRENTICE Corp., Worcester, Mass.
REEVES BROTHERS, Inc., Greenville, S. C., Woodruff, S. C.
REGINA CORP., Rahway, N. J.
REINER & Co., John, Long Island City, N. Y.
REMINGTON ARMS Co., Inc., Bridgeport, Conn., Denver, Colo., Ilion, N. Y., Independence, Md.
REMLER Co., Limited, San Francisco, Cal.
REPUBLIC MINING & Mfg. Co. and Aluminum Co., of America Bauxite, Ark.
REPUBLIC STEEL Corp., Birmingham, Ala., Gadsden, Ala., Canton, O., Massillon, O., Cleveland, O.
REVERE COPPER & Brass Inc., Detroit, Mich., Chicago, Ill.
REX CUTLERY Corp., Irvington, N. J.
REX Mfg. Co., Inc. (Two Plants).
REYNOLDS SPRING Co., Jackson, Mich.
RHEEM Mfg. Co., Sparrows Point Md.
RICE STIX Dry Goods Co., Farmington, Mo.
RICHARDSON Boat Co., Inc., North Tonawanda, N. Y.
RIEKE METAL PRODUCTS Corp., Auburn, Ind.
RIPON KNITING Works, Ripon, Wis.
RITTER Co., Inc., Rochester, N. Y.
RIVET LATHE & Grinder, Inc., Boston, Mass.
ROBERTSHAW THERMOSTAT Co., Youngwood, Pa.
ROBINSON, Inc., W. A., Ipswich, Mass.
ROBINSON INDUSTRIES, Inc., Franklin Plastic Dic., Franklin, Pa.
ROCK ISLAND ARSENAL, Rock Island, Ill.
ROCK RIVER WOOLEN MILLS, Janesville, Wis.
ROEBLINGS SONS Co., John A., Trenton, N. J.
ROGERS BROTHERS Corp., Albion, Pa.
ROGERS DIESEL & Aircraft Corp., Edward Co. Dic., Sanford, N. C.
ROHM & HASS Co., Bristol, Pa.
ROSS GEAR & TOOL Co., Lafayette, Ind.
ROSS-MEEHAN Foundries, Chattanooga, Tenn.
RUSSELL Mfg. Co., Middletown Conn.
RUSTLESS IRON & Steel Corp., Baltimore, Md.
SKF INDUSTRIES, Philadelphia, Pa.
SACO LOWELL Shops, Biddeford, Maine
SACRAMENTO ENGINEERING & Machine Works, Sacramento, Cal.
ST. CROIX GARMENT Co., Stillwater, Minn.
ST. MARY'S Mfg. Co., St. Mary's O.
SAMPLE, Frank L., Jr., Inc., Boothbay Harbor, Me.
SANDERSON & PORTER, Joliet, Ill.
SANGAMO ELECTRIC Co., Springfield, Ill.
SAVAGE ARMS Corp., Utica, N. Y., Stevens Arms Co., Chicopee Falls, Mass.

(Turn to page 222, please)

WHAT FIVE THINGS ARE BEING CUT HERE?



An efficient cutting tool operation cuts more than metal. It also cuts friction, temperature, power expenditure and tool wear.

There is a close link between all these factors and the cutting fluids you use. Unless those fluids are exactly right for each job, the efficiency of the cutting is going to be much lower and the cost higher than it could be.

Why not let a Cities Service Lubrication Engineer check your operation? There's no cost nor obligation. And he'll give you expert advice on which of the precision-perfect Cities Service Cutting Oils will give you the best cutting performance at the least cost of each cutting operation.

Whether your work calls for one or many types of lubricants—Cities Service is ready to serve you with quality products and expert counsel.

Get in touch with your nearest Cities Service office today. Also, for a copy of the highly informative booklet on "Metal Cutting Lubrication" write to Cities Service Oil Company, Room 1334, Sixty Wall Tower, New York, N. Y.

CITIES SERVICE OIL COMPANY
NEW YORK · CHICAGO

IN THE SOUTH
ARKANSAS FUEL OIL COMPANY
SHREVEPORT, LA.

Army-Navy "E" Awards

(Continued from page 220)

SAVANNA ORDNANCE Depot, Proving Ground, Ill.
SCHAUER MACHINE Co., Cincinnati, O.
SCHOLL Mfg. Co., Inc., Chicago, Ill.
SCHWITZER-CUMMINS Co., Indianapolis, Ind.
SCOTT AVIATION Corp., Lancaster, N. Y.
SCOVILL Mfg., Inc., and Schrader's Sons, A. Div., Brooklyn, N. Y.
SCOVILL Mfg. Co., Waterbury, Conn.
SCRIPTO Mfg. Co., Atlanta, Ga.
SEAMLESS RUBBER Co., New Haven,
SEAMLESS RUBBER Co., New Haven, Conn.
SEBASTION LATHE Co., Covington, Ky.
SELLERS & Co., Inc., William, Philadelphia, Pa.
SEMET-SOLVAY Co., Solvay, N. Y.
SENG Co., Chicago, Ill.
SERVEL, Inc., Evansville, Ind.
SERVICE CASTER & Truck Co., Albion, Mich.
SERVICE Corp., J. M. Parsons, Kan.
SHARPE & DOHME, Inc., Glenolden, Pa., Philadelphia, Pa.
SHARPLES CHEMICALS, Inc. ,Wyandotte, Mich.
SHARPLES Corp., Baltimore, Md.
SHEFFIELD Corp., Dayton, O.
SHELL OIL Co., Inc., Wood River, Ill.
SHIPMAN Co., Ralph, Sunbury, Pa.
SHOE LACE Co., Lawrence, Mass.
SIGHT LIGHT Corp., Deep River, Conn.
SILENT HOIST WINCH & Crane Co., Brooklyn, N. Y.
SIMMONS MACHINE TOOL Corp., Albany, N. Y.
SIMONDS SAW & STEEL Co., Fitchburg, Mass.
SIMPLEX WIRE & CABLE Co., Cambridge, Mass.
SIMPSON OPTICAL Mfg. Co., Chicago, Ill.
SINGER Mfg. Co., Elizabethport, N. J.
SKINNER Engine Co., Erie, Pa.
SKLAR Mfg. Co., J., Long Island City, N. Y.
SMITH CO. A. O. Milwaukee, Wis.
SMITH SHIPBUILDING Co., Leathem D., Sturgen Bay, Wis.
SNARE Corp., Frederick, Port Neward, N. J.
SNOW-NABSTEDT Gear Corp., New Haven, Conn.
SNOW & PETRILLI Mfg. Co., New Haven, Conn.
SNOW SHIPYARDS, Inc., Rockland, Me.
SOLAR AIRCRAFT Co., San Diego, Cal.
SOLOMON GOLDSTEIN & Portnoy Co., Brooklyn, N. Y.
SOLVAY PROCESS Co., Hopewell, Va.
SOUTH BEND Lathe Works, South Bend, Ind.
SOUTHERN CHEMICAL Cotton Co., Inc., Chattanooga, Ten.
SOUTHERN STEEL Co., San Antonio, Texas.
SOUTHWEST BOAT Corp., Southwest Harbor, Me.
SPEARIN, PRESTON & Burroughs Inc., and Cox Construction Co., Inc., Newport, R. I.
SPECIALTY Mfg. Co., Houston, Tex.
SPECIALTY SCREW Machine Products Co., Lancaster, Pa.
SPENCER LENS Co., Buffalo & Cheektowaga, N. Y.
SPERRY GRYROSCOPE Co., Inc., Long Island City, N. Y.
SPICER Mfg. Corp., Toledo, O.
SPRINGFIELD ARMORY, Springfield, Mass.
SQUIBB & SONS, E. R., N. Y., New Brunswick, N. J., Brooklyn, N. Y.
S. & S. TOOL & Mfg. Co., Detroit, Mich.
STANDARD BLEACHERY & Printing Co., Carlton Hill, N. J.
STANDARD BRANDS, Inc., Peekskill, N. Y.
STANDARD FORGING Corp., East Chicago, Ind.
STANDARD GAGE Co., Inc., Poughkeepsie, N. Y.
STANDARD OIL Co. of California, Richmond, Cal.
STANDARD OIL DEVELOPMENT, Bayway, N. J.
STANDARD PIEZO Co., Carlisle, Pa.
STANLEY WORKS, Bridgeport, Conn., New Britain, Con.
STAR ELECTRIC MOTOR Co., Bloomfield, N. J.
STAR IRON & Steel Co., Tacoma, Wash.
STEWART Co., Associates, James, Naval Operating Base, Trinidad, B. W. I.
STEWART SILK Corp., Easton, Pa.
STEWART-WARENER Corp., Chicago, Ill., Indianapolis, Ind.
STICKLE STEAM Specialties Co., Indianapolis.
STIFEL & SONS, Inc., J. L. Wheeling, W. Va.
SOCKHAM PIPE FITINGS Co., Birmingham, Ala.
STONER Mfg. Co., Aurora, Ill.
STOW Mfg. Co., Binghamton, N. Y.
STREETER, HACKNEY & Co., Johnstown, N. Y.
STROMBERG-CARLSON Tele. & Mfg. Co., Rocehester, N. Y.
STRONTIUM PRODUCTS Co., Chauncey, O.
STRUTHERS WELLS Co., Warren, Pa.
STRUTERS WELLS-TITUSVILLE Corp., Titusville, Pa., Warner, Pa.
SUMMERILL TUBING Co., Bridgeport, Pa.
SUNCOOK MILLS, Suncook, N. H.
SUNDSTRAND MACHINE TOOL Co., Rockford, Ill.
SUNNEN PRODUCTIONS Co., St. Louis, Mo.

(Turn to page 226, please)

Army-Navy E Awards

SUPERIOR STEEL & Malleable Castings Co., Benton Harbor, Mich.
SUPREME KNITTING Machine Co., Brooklyn, N. Y.
SWIFT Co., Chicago, Ill.
SWITLIK PARACHUTE Co., Trenton, N. J.
SYLVANIA ELECTRIC PRODUCTS, Inc., Emporium, Pa.
SYLVANIA INDUSTRIAL Corp., Fredericksburg, Va.
TACOMA BOAT Building Co., Tacoma, Wash.
TALON, Inc., Meadville, Pa.
TANKERSLEY CONSTRUCTION Co., and Cowen-Norten Construction Co., and Harmon Construction Co., Norman, Okla.
TAYLOR CHAIN Co., S. G., Hammond, Ind.

(Continued from page 222)

TAYLOR-WINDFIELD Corp., Detroit, Mich.
TENNESSEE COAL, Iron and Railroad Co., Bessemer, Ala., Ensley, Ala., Fairfield, Ala.
TERPENING, L. H., New York.
TEXAS GULPH Sulphur Co., Galveston, & Newgulf, Tex.
TEXAS WASHER Co., Houston, Tex.
TEXTILEATHER Corp., and Toledo Dye Works, Toledo, O.
THERMADOR ELECTRICAL Mfg. Co., Los Angeles, Cal.
THIBODAUX BOILER Works, Inc., Thibodaux, La.
THOMAS & BETTS, Elizabeth, N. J.
THOMPSON Co., Henry G., New Haven, Conn.
TIMKEN-DETROIT Axle Co., Waukegon, Ill., Detroit, Mich., Oshkosh, Wis.
TITAN METAL MFG. Co., Bellefonte, Pa.
TITANINE, Inc., Union, N. J.
TITCHENER & Co., E. H., Binghamton, N. Y.
TITEFLEX METAL HOSE Co., Newark, N. J.
TODD & BROWN, Inc., La Porte, Ind.
TODD COMBUSTION Equipment, Inc., N. Y.
TOKHEIM OIL TANK & Pump Co., Fort Wayne, Ind.
TOOLS & GAGES, Inc., Cleveland, O.
TORRINGTON Co.
Bantam Bearings Corp., South Bend, Ind.
TOWMOTOR Corp., Cleveland, O.
TRAILER Co. of America, Cincinnati, O.
TRANSUE & WILLIAMS Forging Corp., Alliance, O.
TRIANGLE PACKAGE Machinery Co., Chicago, Ill.
TRION Co., Trion, Ga.
TROJAN POWDER Co., Seiple, Pa.
TUBE TURNS, Inc., Louisville, Ky.
TWEEDIE FOOTWEAR Corp., Versailles, Mo.
TYER RUBBER Co., Andover, Mass.
TYSON ROLLER BEARING Corp., Massillon, O.
UNION ASBESTOS & Rubber Co., Chicago, Ill., Paterson, N. J.
UNIQUE ART Mfg. Co., Inc., Newark, N. J.
UNITCAST Corp., Toledo, O.
UNITED AIRCRAFT Corp., East Hartford, Conn.
UNITED-CARR Fastener Corp., Cambridge, Mass.
UNITED DRILL & Tool Corp., Detroit, Mich.
UNITED ELASTIC Corp., Easthampton, Mass.
UNITED ENGINEERING & Foundry Co., Youngstown, O.
UNITED SHOE Machiery Corp., Beverly, Mass.
UNITED SPECIALTIES Co., Philadelphia, Pa.
UNITED SATES AUTOMATIC Corp., Amherst, O.
UNITED STATES COAST Guard, Curtis Bay, Md.
UNITED STATES MACHINE Corp., Lebanon, Ind.
UNITED STATES RUBBER Co., Des Moines, Ia., Mishawaka, Ind.
UNITED WALLPAPER Factories, Inc., Chicago, Ill.
UNITED WIRE & Supply Corp., Providence, R. I.
UNIVERSAL BORING Machine Co., Hudson, Mass.
UNIVERSAL BUILDING Products Corp., Dallas, Tex.
UNIVERSAL CAMERA Corp., New York, N. Y.
UNIVERSAL UNIT POWER Shovel Corp., Milwaukee, Wis.
UXBRIDGE WORSTED Co., Uxbridge, Mass.
VANADIUM CORP. of America, Bridgeville, Pa.
VARD, Inc., Pasadena, Cal.
VEEDER-ROOT, Inc., Hartford, Conn.
VEGA AIRCRAFT Corp., Burbank, Cal.
VENDO Co., Kansas City, Mo.
VERMONT TAP & Die Corp., Lyndonville, Vt.
VICTOR CHEMICAL Co., Mt. Pleasant, Tenn.
VICTOR EQUIPMENT Co., San Francisco, Cal.
VICTORY PLASTIC Co., Hudson, Mass.
VILTER Mfg. C., Milwaukee, Wis.
VINCO Corp., Detroit, Mich.
VIRGINIA BRIDGE Co., Roanoke, Va.
VIRGINIA ENGINEERING Co., Inc., Norfolk, Va.
VITALE FIREWORKS Mfg. Co., New Castle, Pa.
VULTEE AIRCRAFT, Inc., Vultee Field, Cal.

(Turn to page 228, please)

Awards

(*Continued from page 226*)

WADSWORTH WATCH Case Co., Dayton, Ky.
WAGNER ELECTRIC Corp., St. Louis, Mo.
WALLACE & Tierman Products, Inc., Belleville, N. J.
WALWORTH Co., South Boston, Mass., Kewanee, Ill.
WANNAMAKER CHEMICAL Co., Orangeburg, S. C.
WARD LEONARD Electric Co., Mount Vernon, N. Y.
WARE SHOALS Mfg. Co., Ware Shoals, S. C.
WARREN WEBSTER & Co., Camden, N. J.
WATERHOUSE Co., Webster, Mass.
WATERTOWN ARSENAL, Watertown, Mass.
WATERVLIET ARSENAL, Watervliet, N. Y.
WAUREGAN-QUINEBAUG Mills, Inc., Wauregan, Conn.
WAVERLY TOOL Co., Irvington, N. J.
WEATHERHEAD Co., Cleveland, O.
WEAVER Mfg. Co., Springfield, Ill.
WEBER SHOW CASE & Fixture Co., Inc., Los Angeles, Cal.
WEBBER GAGE Co., Cleveland, O.
WEBSTER-BRINKLEY Co., Seattle, Wash.
WECK & Co., Inc., Edward, Brooklyn N. Y.
WEIR KILBY Corp., Cincinnati, O.
WELLMAN Engineering Co., Cleveland, O.
WEST CONSTRUCTION Co., Kenai Peninsula, Alaska.
WESTERN CARTRIDGE Co., East Alton, Ill.
WESTERN ELECTRIC Co., N. Y.
WESTERN GEAR WORKS, Seattle, Wash.
WESTERN STOVE Co., Inc., San Bernardino, Cal.
WESTINGHOUSE ELECTRIC & Mfg. Co., Baltimore, Md., East Pittsburgh, Essington, Philadelphia, and Sharon, Pa., Newark, N. J., East Springfield, Mass.
WESTON ELECTRICAL Instrument Corp., Newark, N. J.
WESTON, Inc., Andrew.
WEST POINT Mfg. Co., Langdale, and Shawmut, Ala.
WHEELING Corrugating Co., Wheeling, W. Va.
WHITE Co., David, Milwaukee, Wis.
WHITE DENTAL Mfg. Co., S. S., Staten Island, N. Y.
WHITE MOTOR Co., Cleveland, O.
WHITMAN CO., William, Lawrence Mass.
WHITNEY BLAKE Co., New Haven Conn.
WHITTINGTON Pump & Engineering Co., Indianapolis, Ind.
WEIR KELBY Corp., Cincinnati, O.
WIGTON-ABBOT Corp., and Mahoney-Troast Construction Co., Bayonne, N. J.
WILLIAMETTE HYSTER Co., Peoria, Ill.
WILLIAMS OIL-O-MATIC Heating Corp., Bloomington, Ill.
WILLYS-OVERLAND Motors, Inc., Toledo, O.
WILTON WOOLEN Co., Wilton, Me.
WINN'S SONS, J. H., Winchester, Mass.
WINTER WEISS Co., Denver, Colo.
WINTHROP CHEMICAL Co., Inc., N. Y.
WISCONSIN BRIDGE & IRON Co., Milwaukee, Wis.
WITTEK Mfg. Co., Chicago, Ill.
WOOD Co., Inc., T. H., South Coventry, Conn.
WOOD Mfg. Co., John, Muskegon, Mich.
WOOD MOSAIC Co., Highland Park Div., Louisville, Ky.
WOODWARD GOVERNOR Co., Rockford, Ill.
WOODWORTH Co., Inc., N. A., Ferndale, Mich.
WORTHINGTON PUMP & Machinery Corp., Harrison, N. J., Wellsville, N. Y., Holyoke, Mass., Buffalo, N. Y.
WORUMBO Mfg. Co., Lisbon Falls, Me.
WRIGHT AERONAUTICAL Corp., Lockland, O., Paterson, N. J.
WRIGHT MACHINE Co., Worcester, Mass.
WYMAN-GORDON Co., Harvey, Ill., Worcester, Mass.
YORK-HOOVER Body Corp., York Pa.
YORK SAFE & Lock Co., York, Pa.
YOUNGSTOWN WELDING & Engineering Co., Youngstown, O.
ZENITH DREDGE Co., Duluth, Minn.
Zenith Optical Co., Huntington, W. Va.
ZENITH RADIO Corp., Chicago, Ill.
ZUKERT Co., A. B., Milwaukee, Wis.

Company Name Changed

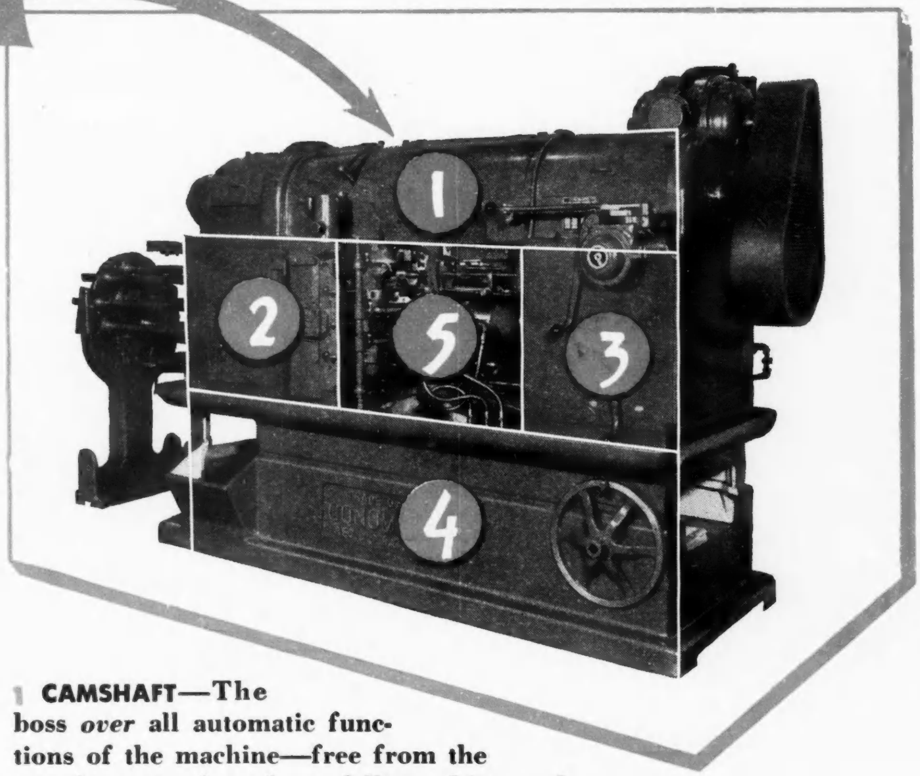
Industrial Sheet Metal Works, Detroit, has changed its name to Industrial Equipment Corporation. Established in 1929, the company is well known as a manufacturer of dust collecting and spray booth equipment, as well as ovens and ventilating systems. One of the company's best known developments is the Hydro-Whirl Dust Collector, for which it holds patents. The spray booths produced by the company also are equipped with Hydro-Whirl.

Plan-O-Mill Moves

New manufacturing plant and general offices of the Plan-O-Mill Corporation, formerly at Royal Oak, Mich., are located at 1511 East 8 Mile Road, Hazel Park, Mich., just outside Detroit.

Plan-O-Mill Corporation, in addition to manufacturing thread and form milling machines, are now producing a line of cutters.

Boss OVER 5 ORDERLY DEPARTMENTS



1 CAMSHAFT—The boss *over* all automatic functions of the machine—free from the interference of coolant, falling chips and dirt, yet easily accessible for quick cam changes.

2 WORK HEAD—Rigid, compact unit for spindle carrier and cross-slide support.

3 GEAR BOX—Large, right end support housing the accessible speed and feed change gears.

4 BASE—Rugged—roomy for chips and coolant reservoir.

5 PRODUCTION AREA—Spacious and convenient—where departmental arrangement proves its value in accurate, quality work.

Conomatic design has always been appreciated by the production man and experienced operator—it is of vital importance in training new operators.

Write, wire, or phone for further information.

CONE AUTOMATIC MACHINE CO., INC.
WINDSOR, VERMONT
U. S. A.

ARMY E NAVY

Awards

(Continued from page 226)

WADSWORTH WATCH Case Co., Dayton, Ky.
WAGNER ELECTRIC Corp., St. Louis, Mo.
WALLACE & Tierman Products, Inc., Belleville, N. J.
WALWORTH Co., South Boston, Mass., Kewanee, Ill.
WANNAMAKER CHEMICAL Co., Orangeburg, S. C.
WARD LEONARD Electric Co., Mount Vernon, N. Y.
WARE SHOALS Mfg. Co., Ware Shoals, S. C.
WARREN WEBSTER & Co., Camden, N. J.
WATERHOUSE Co., Webster, Mass.
WATERTOWN ARSENAL, Watertown, Mass.
WATERVLIET ARSENAL, Watervliet, N. Y.
WAUREGAN-QUINEBAUG Mills, Inc., Wauregan, Conn.
WAVERLY TOOL Co., Irvington, N. J.
WEATHERHEAD Co., Cleveland, O.
WEAVER Mfg. Co., Springfield, Ill.
WEBER SHOW CASE & Fixture Co., Inc., Los Angeles, Cal.
WEBBER GAGE Co., Cleveland, O.
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WEIR KILBY Corp., Cincinnati, O.
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WHITE MOTOR Co., Cleveland, O.
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WHITNEY BLAKE Co., New Haven Conn.
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WILLIAMETTE HYSTER Co., Peoria, Ill.
WILLIAMS OIL-O-MATIC Heating Corp., Bloomington, Ill.
WILLYS-OVERLAND Motors, Inc., Toledo, O.
WILTON WOOLEN Co., Wilton, Me.
WINN'S SONS, J. H., Winchester, Mass.
WINTER WEISS Co., Denver, Colo.
WINTHROP CHEMICAL Co., Inc., N. Y.
WISCONSIN BRIDGE & IRON Co., Milwaukee, Wis.
WITTEK Mfg. Co., Chicago, Ill.
WOOD Co., Inc., T. H., South Coventry, Conn.
WOOD Mfg. Co., John, Muskegon, Mich.
WOOD MOSAIC Co., Highland Park Div., Louisville, Ky.
WOODWARD GOVERNOR Co., Rockford, Ill.
WOODWORTH Co., Inc., N. A., Ferndale, Mich.
WORTHINGTON PUMP & Machinery Corp., Harrison, N. J., Wellsville, N. Y., Holyoke, Mass., Buffalo, N. Y.
WORUMBO Mfg. Co., Lisbon Falls, Me.
WRIGHT AERONAUTICAL Corp., Lockland, O., Paterson, N. J.
WRIGHT MACHINE Co., Worcester, Mass.
WYMAN-GORDON Co., Harvey, Ill., Worcester, Mass.
YORK-HOOVER Body Corp., York Pa.
YORK SAFE & Lock Co., York, Pa.
YOUNGSTOWN WELDING & Engineering Co., Youngstown, O.
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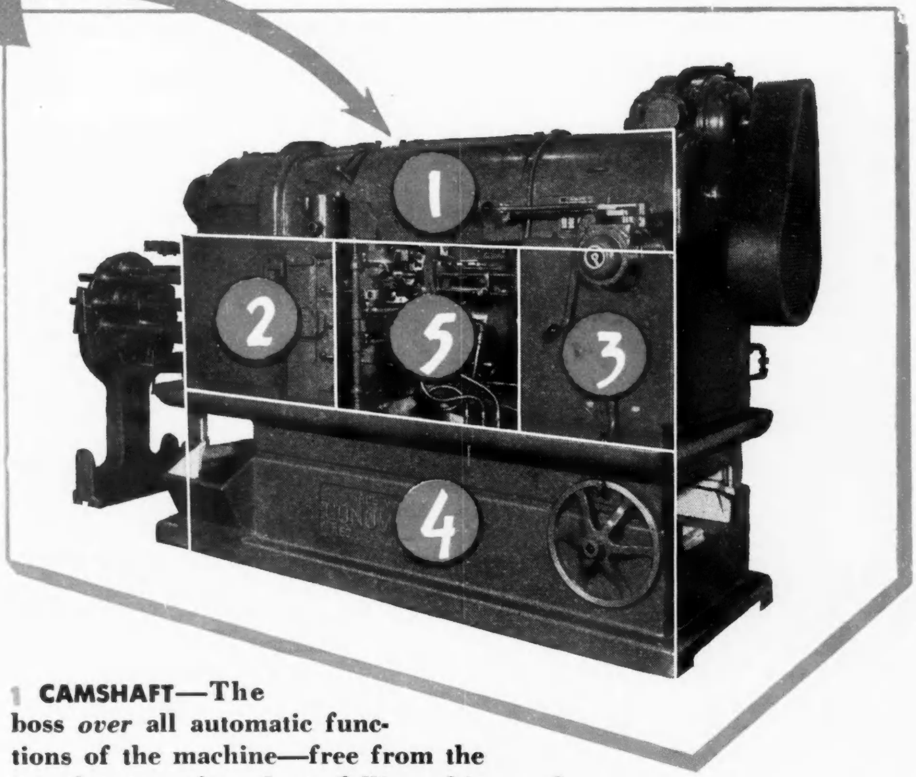
Boss OVER 5 ORDERLY DEPARTMENTS



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4 **BASE—Rugged—roomy for chips and coolant reservoir.**

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CONE **AUTOMATIC MACHINE CO., INC.**
WINDSOR, VERMONT
U. S. A.

BOOKS

(*Continued from page 148*)

THE NATIONAL PAINT DICTIONARY, *by Jeffrey R. Stewart. Published by the Stewart Research Laboratory, Washington, D. C.*

The volume under review is a reference book for use by chemists and others engaged in the paint and allied industries. The term "Dictionary" hardly does it justice, because it contains a great deal of information beyond the mere definition of terms. The paint industry has seen rapid development during the past two decades, and it is therefore no wonder that its terminology should not be entirely settled. In compiling the work it has been the author's aim to give terms and definitions which have the general approval of leaders in both producer and consumer fields, and to that end he secured the cooperation of a number of experts in various branches of the industry. In addition to giving definitions of technical terms used in the paint and allied industries, the book lists the raw materials employed by the industry and describes methods of analysis as well as the equipment and apparatus employed in testing paints and allied products. The book is well illustrated.

FOREMANSHIP AND SAFETY, *by C. M. MacMillan. Published by John Wiley & Sons, New York.*

This little book contains a number of well-written essays on hazards in industrial establishments and means to avoid them. It is addressed to foremen, through whom any program for industrial safety must be put into effect. The book contains 27 chapters, each devoted to a particular aspect of the general industrial safety problem, and the discussion of the particular problem dealth with in the chapter is followed by a "Prepared Talk," suitable for delivery at a safety meeting.

The recently-completed 1942 BOOK OF A.S.T.M. STANDARDS, issued in three parts, contains in their latest approved form all of the Society's specifications and tests for materials, definitions, and recommended practices. It contains 1990 specifications and has more than 4900 pages. To keep the book up to date in 1943 and 1944, a supplement will be issued to each part in each of these years. A 200-page Index to Standards is furnished free with each part or each set. The cost of each Part is $9.00, while the charge for the Supplement is $3.00 for each part each year. Half-leather binding adds $1.00 for each part and each supplement part. Copies can be obtained from the American Society for Testing Materials, 260 South Broad Street, Philadelphia.

MODERN METHODS OF GEAR MANUFACTURE, SECOND EDITION. *Published by the National Broach & Machine Co., Detroit, Mich.*

This book marks a complete revision of the first edition, includes discussion of the advances in design, production practice, and techniques that have taken place in the interim.

In its present form, the book covers the following aspects of gear manufacture and design—gear design principles, gear data—formulas and charts, selection and forging of gear steels, heat treatment of gear steels, machining practice, advanced production techniques, special gear problems and case studies, Red Ring products.

This text is recommended for the bookshelf of engineers and designers, gear specialists, and production men. Between its covers is a wealth of information, particularly as to gear finishing by shaving, that should make for profitable reading in every automotive plant engaged in war production. Special attention has been given to the problems of aircraft engine gearing with case studies of application of the principle of shaving which has been adopted so widely during the past few years.

DIE CASTING FOR ENGINEERS *Published by The New Jersey Zinc Co., New York, N. Y.*

This book covers the latest available information collected on the subject, includes details best visualized from the following outline of the contents—historical notes, alloys for die casting, elements of die construction, die casting applications, material specifications, inspection and tests, machining practice, jigs and fixtures, finishes, design of die castings, index.

In all, this little volume covers the entire subject of die castings, succinctly but comprehensively and should prove of value to everyone concerned with the design and fabrication of parts made by the die casting process. The text is profusely illustrated with photographs, special drawings and tabular data.

INTRODUCTION TO AIRCRAFT DESIGN *by Thomas P. Faulconer, director of Education, Consolidated Aircraft Corp., 273 pp., pub. McGraw-Hill Book Co.*

Stemming from a course conducted by the University of California in training engineers and draftsmen to fit into the airplane industry, this book has been developed as a reference manual of practical value to those engaged in training engineering personnel for the aircraft industry and for vendors catering to the airplane industry. It has been so developed as to provide a background of information for the benefit of technical men with a general training who desire to assume the job of specialists.

Among the topics covered in this volume are—aerodynamics, power-plant installation, wing structure, hull design, aircraft hydraulics, electrical equipment, structural design, fixed equipment, landing gear de-


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sign, materials. It covers these topics succinctly but comprehensively without encroaching upon the basic scientific principles which are presumed to be a part of the background of the student.

VERSUCHE UBER KOLBENRINGREIBUNG UND UNDICHTIGKEITSVERLUSTE *(Investigation on Piston-Ring Friction and Leakage Losses), by Dr. H. Horgen. Published by Verlag A.G. Gebr. Leeman, Zurich, Switzerland.*

This work in brochure form represents a thesis presented to the Federal Technical College of Zurich, and is published under the sponsorship of Professor Dr. G. Eichelberg. Previous literature of ring friction and piston leakage is critically reviewed; the subject of ring friction is investigated theoretically on a hydrodynamic basis, the experimental equipment and the test method employed by the author are described, and the results obtained are discussed.

In measuring piston ring friction, use was made of a special testing machine comprising a stationary piston and a reciprocating cylinder sleeve surrounding the latter. Power for the operation of the machine was obtained from a 60 kw nonsynchronous electric motor, which delivered its output through a gear train and a variable belt drive to the crankshaft of a two-cylinder Diesel engine. The piston in one of the Diesel cylinders served as a crosshead for driving the sleeve of the testing machine, to which it was connected by a piston rod with a ball joint at the sleeve end. The stationary piston of the testing machine rested axially on a quartz-type indicator. During the up-stroke of the sleeve the piston friction loaded the indicator, while during the down-stroke it unloaded the same, which necessitated preloading the piston in the upward direction.

Besides a thorough discussion of the results obtained, the publication contains a bibliography of piston-ring friction and piston leakage.

NEW TECHNICAL AND COMMERCIAL DICTIONARY, ENGLISH-SPANISH, *by Antonio Perol Guerrero, Industrial Engineer. Published by Editorial Tecnica Unida, Brooklyn, N. Y.*

This English-Spanish dictionary contains some 50,000 words and terms used in electrical, chemical, mechanical and marine engineering, and in the radio, mining, textile and other industries. It also includes numerous relatively new words used in mechanized and motorized warfare, aviation, meteorology, etc. The dictionary comprises three sections. In the first the Spanish words are given in alphabetical order, with their equivalents in English; in the second section the English words are given in alphabetical order, with their Spanish equivalents, while the third section contains conversion tables for weights and measures and for monetary units. This dictionary should prove useful to engineers and businessmen who have occasion to read Spanish technical literature or to handle correspondence in Spanish on technical subjects.

Life of Electrodes Lengthened by Care

If vital war production is not to be impeded by lack of arc-welding electrodes, utmost cooperation of electrode manufacturers and users to make the most of the electrode being produced is essential. So said H. O. Westendarp, welding engineer of the General Electric Company, in a talk before the Cleveland Section of the American Welding Society.

Mr. Westendarp pointed out that electrode manufacturers are operating around the clock, seven days a week. In addition, bare portions of electrodes have been reduced to a minimum in order to lower stub losses, and development laboratories have improved coatings to bring about reduced spatter loss.

The big job of getting the most out of available electrode, however, he declared, was up to users of arc welding. In this connection, he suggested the following six-point program as a guide: Select largest diameter and greatest length electrode that can be applied successfully. This not only speeds up deposition rates of weld metal, but also results in a decided increase in the tonnage of electrode that can be extruded per day from existing facilities. Joints to be welded must have good fit-up, excessive gaps are prolific wasters of metal. Use proper amperage for the job, avoid excessive currents and long arcs. There is a current beyond which deposition rate is decreased and electrode consumption increased. Don't bend electrodes except where absolutely necessary. Bent electrodes destroy electrode coating and result in excessive stub losses. Produce true fillet welds having equal legs—this is a function of proper type of electrode coating and welding technique. Use each electrode down to point where full coating diameter ends.

First over Europe and now over Africa, these Douglas Boston attack bombers have been singled out by the R.A.F. for praise in strafing enemy troops and supply columns, riddling them with machine gun bullets and pulverizing them with fragmentation bombs. Accompanying these bombers on every trip are RBC Needle Bearings of minimum overall dimensions and weight, with the utmost static capacity and high in anti-friction characteristics.

ROLLER BEARING CO. of AMERICA

TRENTON . . . . NEW JERSEY

Earnings of Manufacturing Companies in 1941-42

From March Monthly Letter of the National City Bank of New York

Annual reports for 1942 issued by leading companies reflect the tremendous expansion made in the volume of production by American industry last year in meeting the unprecedented demands for war products and materials. New high records in value of output were established by a large portion of the companies reporting, although many companies in the non-war industries had only moderate gains and a considerable number experienced actual decreases, due to priorities on raw materials and inability to convert to war goods. New peaks were reached last year in employment and payrolls in the manufacturing industries as a whole, with increases over 1941 of 13 per cent and 42 per cent respectively.

In contrast with these increases in industrial volume, corporate earnings were generally lower. A tabulation of the reports of 710 leading manufacturing companies, having aggregate capital and surplus of approximately $12,585 millions at the beginning of last year, shows combined net income (less deficits) in 1942 of $2,210 millions after taxes, which compares with $1,397 millions for the same companies in 1941 and represents a decrease of 1 per cent.

The figures, subject in many cases to renegotiation of the terms of government contracts, indicate that the fourth quarter had better earnings than the preceding three quarters. One factor in the better fourth quarter showing was the adjustment of previous over-reserves for taxes; larger volume and completion of conversion were also important.

The great expansion in business last year brought in most cases an increase in net income before taxes, despite the rise in labor and material costs and in reserves. There were exceptions, however, among representative companies in the steel, automobile, chemical and

710 Leading Manufacturing Companies
(In Millions of Dollars)

	1941	1942	% Chg
Net income before taxes	$2,712	$3,605	+3[illegible]
Fed. income & e.p. taxes*	1,315	2,395	+8[illegible]
Net income after taxes	$1,397	$1,395	−1[illegible]
Percentage of net income taken by taxes	48.5%	66.4%	

* After deducting post-war credits.

other lines, whose net income before taxes was lower.

Estimated liability for federal income and excess profits taxes of the group increased from approximately $1,315 millions in 1941 to $2,395 millions in 1942, based on tax details given by companies accounting for nine-tenths of the total net income in 1942. The effect of such taxes was to absorb about 66 per cent of net income in 1942 against 48 per cent in 1941. The summary above includes companies having fiscal years ending prior to December 31 and therefore subject to the higher tax rates only since July 1, thus tending somewhat to overstate the aggregate earnings on a calendar year basis and understate the part taken by taxes.

Ford Engine Order Is Doubled

Ford Motor Company, already producing Pratt & Whitney 2000 hp aircraft engines in volume in a new factory at the Rouge, has been asked to double its output of these radial power plants. However, due to the manpower shortage in Detroit, Ford will subcontract a number of the engine parts to manufacturers in Michigan and other states which are located in areas where there is a sufficient labor supply. Other parts will be made by Ford branch plants, with the Aircraft Building at the Rouge serving chiefly as a final assembly plant.

burned out motor

back on the job in 22 hours

BURNED-OUT MOTOR OF SPECIAL DESIGN RECEIVED 5:00 P. M. AT WESTINGHOUSE DISTRICT MANUFACTURING AND REPAIR PLANT. REPLACEMENT IMPOSSIBLE TO OBTAIN. MOTOR STRIPPED, REWOUND. STATOR DIPPED, BAKED, ASSEMBLED AND TESTED. DELIVERED TO USER FOLLOWING DAY, 3:00 P. M.—22 HOURS AFTER BREAKDOWN.

Westinghouse

DISTRICT MANUFACTURING AND REPAIR

J-90468

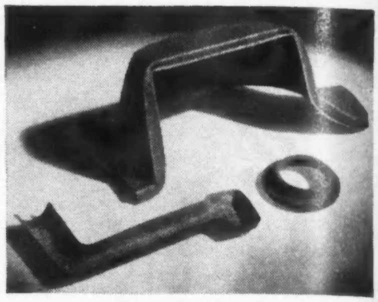
IF THE EQUIPMENT NEEDING REPAIR IS VITAL TO THE WAR EFFORT . . . PHONE THE NEAREST OFFICE OF WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY FOR

EMERGENCY SERVICE

33 M & R PLANTS . . . ONE NEAR YOU!

Molded Felt Replaces Critical Materials

It took a second world war to demonstrate the remarkably wide adaptation to industrial use of felt, one of the world's oldest materials. Especially in the aircraft and automotive fields, chemists and design engineers have collaborated to employ felt, treated and formed, for numerous tasks heretofore



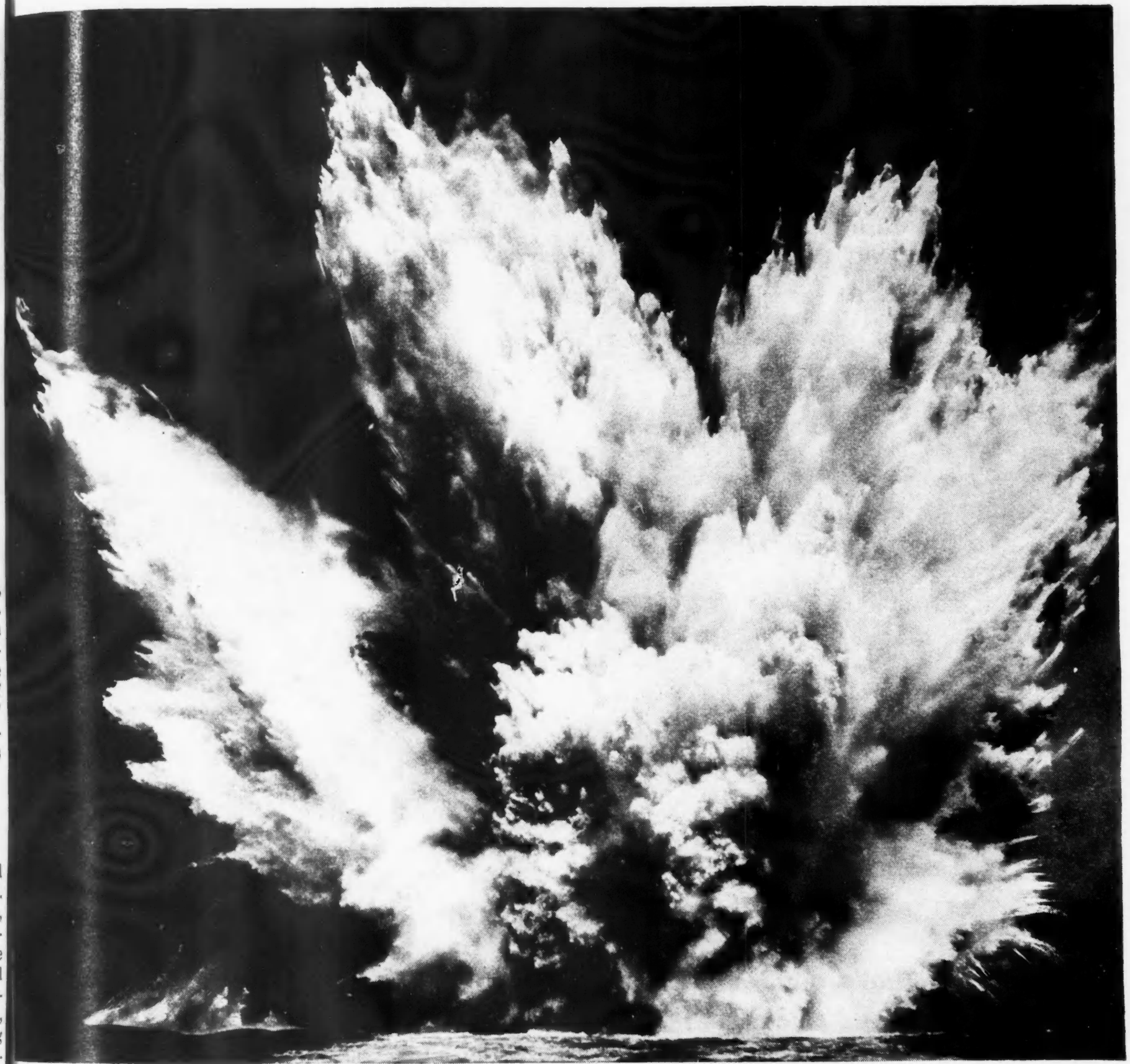
Felt treated and molded "overcoat" for an aircraft instrument.

performed by rubber, synthetic rubber, copper and other critical materials. Chemists and engineers of the Western Felt Works have contributed to the effort to relieve material problems. The illustration shows a cut-away view of a felt treated and molded "overcoat" for one of a fighting plane's instruments. Each one is held to close limits of treating, molding and cutting.

New A.S.T.M. Methods

A.S.T.M. Committee E-3 on Chemical Analysis of Metals headed by G. E. F. Lundell, National Bureau of Standards, has perfected two new A.S.T.M. methods, one covering Analysis of Zinc-Base Alloy Die Castings (E 47 – 42 T) and the other Chemical Analysis of Tin-Lead-Base Solder Metal (E 46 – 42 T), the latter superseding the existing Tentative Methods of Chemical Analysis of Alloys of Lead, Tin, Antimony, and Copper (B 18 – 36 T). The standard for analysis of solder metal prescribes methods for the determination of tin, arsenic, antimony, copper, bismuth, and iron. In this class of alloys the lead content is arrived at by difference. The committee also is developing methods for determining zinc and aluminum in solder metal, which will later be issued as a supplement to standard E 46. The other new method, E 47, covers the determination of lead, aluminum, copper, magnesium, cadmium and iron in zinc-base alloys, these materials being covered in the Tentative Specifications for Zinc-Base-Alloy Die Castings (B 86 – 41 T).

Important changes have been made in the emergency provisions effecting the specifications for soft solder metal (B 32 – 40 T) involving some additional recommended emergency grades and the inclusion of considerable appended data on uses and applications as well as properties.



New Products for Aircraft

(*Continued from page* 132)

its own thread. Small nails, driven into the slot, lock the insert to prevent its turning. The inserts may be screwed into tapped holes in plastics or soft metals, or molded directly into plastics.

Masking Paper Cement Uses No Crude Rubber

An adhesive to replace the conventional cement used on masking paper for protecting the highly polished optical surfaces of plastic noses and transport enclosures for military aircraft, is a new development of the Plastics Department, E. I. du Pont de Nemours & Company, Wilmington, Del.

More than one hundred different adhesives, most of them compounded in du Pont laboratories, were tested during the year-long search for a crude rubber replacement. The chemical and physical properties of virtually all synthetic rubber-like materials were examined. Primarily the adhesive had to seal the protecting paper to the plastic enclosures through all handling, shipping, fabricating and assembly, because the paper is not stripped off until the bomber or fighter is ready for its initial flight. It had to withstand extremes of temperature and humidity, strip off easily without leaving a deposit, but not self-strip. Furthermore, the adhesive could have no chemical effect on the plastic, and should not cause frosting, crazing, swelling or discoloration. It had to retain its adhesive qualities for long periods, it could not curl up at the edges and peel in the sunlight or when the plastic was being cut, sawed or drilled. It had to be reusable if the paper should be removed during heating and forming operations. The new du Pont product is said to meet all these rigid requirements and to stand up better than crude rubber adhesive in sunlight. It does not age as fast as crude rubber adhesive and is more uniform in quality. The new adhesive is approved by the Army Air Corps and Navy.

Air Compressors For Aviation Use

The Buell Manufacturing Co., Chicago, Ill., is furnishing Buell air compressors for aviation use. These compressors are being used on bomber planes where reliable operation is of the utmost importance. Their small size simplifies installation, and they are said

Buell Air Compressor for aviation use.

to give long service without frequent parts replacement. The use of air on both Canadian and British planes is quite common. Air in a reservoir can be utilized to operate the plane's brakes when loading, to cock machine guns, or to perform any function requiring expenditure of energy in a large plane.

Detroit Rex Opens Southern Office

The Detroit Rex Products Company, metal cleaning engineers, has established new regional sales and service offices in Birmingham, Ala. The address is Detroit Rex Products Company, 2308 4th Avenue, North, Birmingham, Ala.

TOUGH NUTS TO CRACK

● We've made billions of Elastic Stop Nuts.

And to our knowledge not one has failed to do its job.

But the tough nuts we refer to now are the fastening problems which looked hopeless until Elastic Stop Nuts were used.

We've met lots of these in our day—and licked them.

There have been plenty of them in war production.

And how well these fastenings have filled the bill can best be told this way:

Every nut we can possibly produce is going into war goods. Yet even doubling our round-the-clock plant capacity hasn't let us gain on the demand.

In the days to come there will be many peacetime needs for these nuts.

Some will be simple. Others will look like "tough nuts to crack."

Our engineers like to meet both kinds. They stand ready to share their experience with you, work on your fastening problem and recommend the proper Elastic Stop Nut application for the job.

ELASTIC STOP NUTS

Lock fast to make things last

ESNA TRADE MARK

ELASTIC STOP NUT CORPORATION OF AMERICA
UNION, NEW JERSEY

New Production Equipment

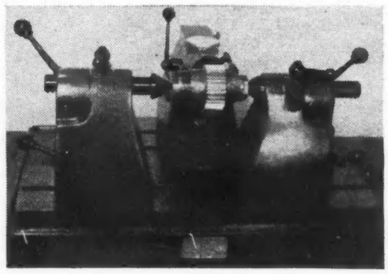
(Continued from page 130)

have a maximum capacity for gears up to 12 inches pitch diameter, the maximum distance between centers being 15 inches.

These fixtures comprise a base upon which three adjustable brackets are mounted. Two of the brackets carry the work-holding centers; and the third bracket, which is located at right angles to the brackets carrying the centers, retains the measuring pointers, fingers and dial indicator, as well as the indexing mechanism.

Fellows fixture for checking circular pitch or tooth to tooth spacing.

The head- and tail-stock brackets are provided with clamping levers. The spindles carrying the centers are adjusted through a rack and pinion, and are clamped by levers. The bracket carrying the measuring pointers can be located in two positions, which together with the adjustable spindle, will handle any gear within the capacity of the fixtures. A work-indexing device is connected to the lever operating the pointer holder, which on the return stroke automatically indexes the work. The indexing fingers are adjustable for different pitches and numbers of teeth.



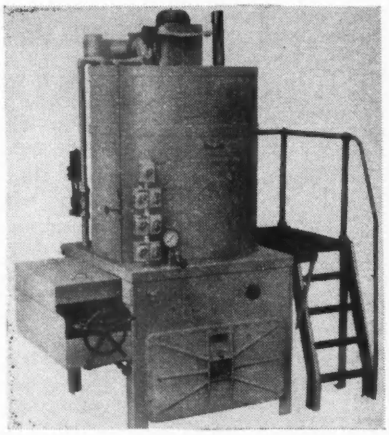
Fellows Cone-Point Testing fixture for use in checking concentricity of external spur and helical.

On the circular-pitch testing fixture, the spindle carrying the locating and measuring fingers is provided with a graduated collar at the rear end, so that the fingers can be set normal to the helix, if desired, when checking helical gears. The measuring brackets for cone-point and circular-pitch testing are interchangeable on the same base. These fixtures are intended for use on a bench.

An oil reclaimer designed for aircraft engine builders to be used in salvaging oil drained from aircraft engines, is being manufactured by Youngstown Miller Company, Sandusky, Ohio. These new models have a capacity of 200 gallons of oil in 90 minutes, and are said to restore the used oil to new oil values of viscosity, fire and flash, neutralization number, and color. The reclaimers will also salvage transformer oil or hydraulic oil.

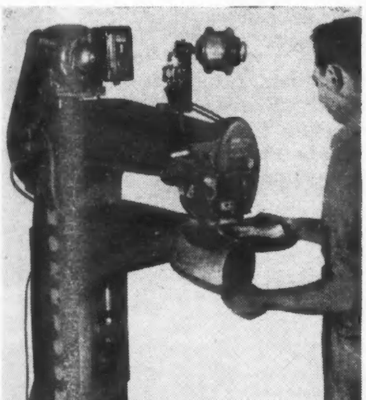
In operation, the dirty oil is charged to the reclaimer by a motor-driven pump equipped with an automatic float control which controls the quantity pumped into the machine. The operator next adds refiners' earth, then turns

on the switch which starts the electric heaters and the agitator motor. The machine is thermostatically controlled, and signal lights indicate when the mixture of heated oil and earth reaches the proper temperature. Delivery to the finished tanks is through the filter press, which separates the oil from the earth. The earth remains, together with the contaminants which it has removed from the oil, in the filter press as a dry cake.



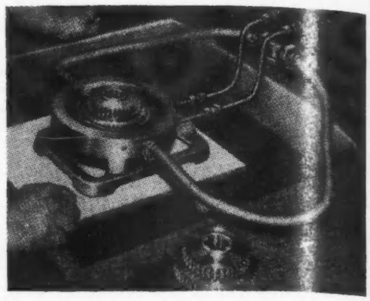
Youngstown Miller Oil Reclaimer

THE Morrison Sticher, made by the Seybold Division of Harris-Seybold-Potter Co., Dayton, Ohio, was designed primarily for stitching aluminum and stainless steel, but is said to work equally well on cold rolled steel, cork, asbestos, rubber, wood, canvas, and other such materials. The machine forms its own stitch (or staple) from a coil of wire, drives, and clinches it in a single operation. No pre-punching is required, the machine provides support of the stitch so that the wire acts as a punch, and punches out a clean slug from the metal. The stitcher is driven by a half-horsepower motor, and controlled by a non-repeat solenoid trip with safety foot guard.



The Morrison Stitcher

THE Van Norman Machine Tool Co., Springfield, Mass., announces two new induction heating units for surface hardening, brazing, soldering, and other heating applications requiring localized heat. Available in two sizes, 16 kw. and 32 kw., the Van Norman Induction Heating Units are said to meet the average requirements of most plants. Each machine is a completely enclosed unit, adaptable for low cost hardening and heating of parts manufactured in small lots, or it can be incorporated into a



Surface hardening the teeth of a gear on the Van Norman Induction Heating Unit.

production line. The heating operation of the units is automatic after the operator has connected the proper heating coil for a particular job and set the heat and quench cycle required.

Synthetic Corundum

(*Continued from page 128*)

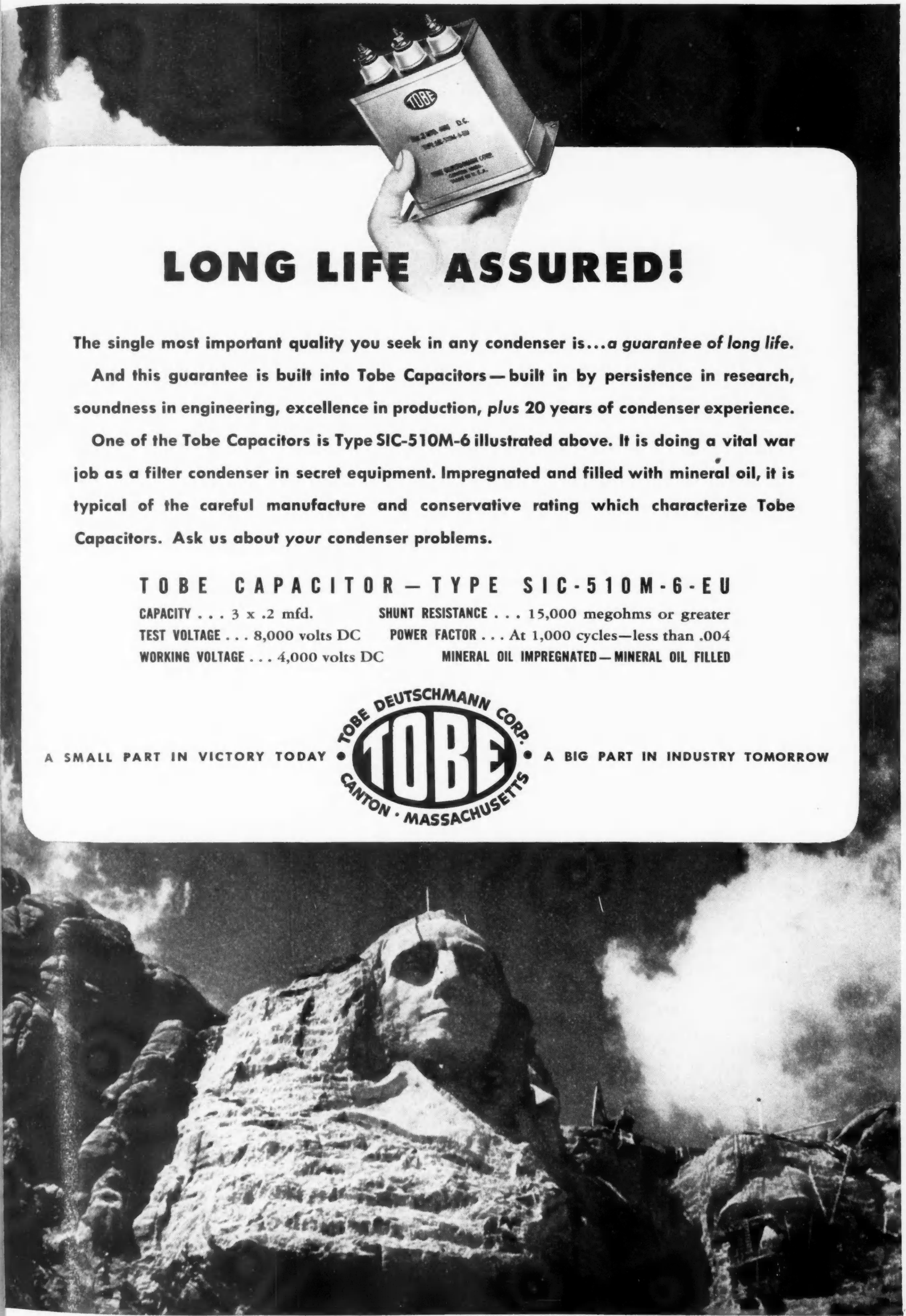
and are of a regular cylindrical shape, enabling gem cutters to standardize on cutting and sawing procedures.

Instigated by the need of a domestic source of industrial gems, the manufacturer in less than two years equalled and, in some respects, has surpassed the quality of European gems, formerly the only synthetics obtainable. Since domestic production started, it has grown so that it is now capable of handling the entire military demand for all the United Nations.

Mineralogically, the hardness of the American white sapphire is exceeded only by the diamond. Once they are cut, the jewels are suprisingly tough in terms of resistance to breakage by impact. Moreover, because they have a melting point of over 3,700 deg. F., they are also heat resistant to a high degree. An additional advantage is the boules' uniformity of size and shape, which leads to economical cutting.

Magnets Hold Signals

When the director of the Ground School at Brooks Air Field in Texas read a magazine account of how small Alnico magnets were used to post papers on a steel partition serving as a bulletin board at the General Electric plant, he requested several magnets to replace pins for holding up code-signal model panels. Such signals are used for ground-to-air communication when other means of communication are lacking, or when radio silence is imperative. The magnets, which also serve as handles, were secured to heavy cardboard rectangles placed on a steel-plate background. Panels may be changed instantly by sliding them back and forth, or by lifting them from one spot and applying them in another. Tests are said to have shown that the new method permits of making panel changes in 1/200 the time it takes with pins.


LONG LIFE ASSURED!
The single most important quality you seek in any condenser is...*a guarantee of long life.*
And this guarantee is built into Tobe Capacitors—built in by persistence in research, soundness in engineering, excellence in production, *plus* 20 years of condenser experience.
One of the Tobe Capacitors is Type SIC-510M-6 illustrated above. It is doing a vital war job as a filter condenser in secret equipment. Impregnated and filled with mineral oil, it is typical of the careful manufacture and conservative rating which characterize Tobe Capacitors. Ask us about *your* condenser problems.
TOBE CAPACITOR—TYPE SIC-510M-6-EU
CAPACITY . . . 3 x .2 mfd.
SHUNT RESISTANCE . . . 15,000 megohms or greater
TEST VOLTAGE . . . 8,000 volts DC
POWER FACTOR . . . At 1,000 cycles—less than .004
WORKING VOLTAGE . . . 4,000 volts DC
MINERAL OIL IMPREGNATED—MINERAL OIL FILLED
A SMALL PART IN VICTORY TODAY
TOBE DEUTSCHMANN CORP.
TOBE
CANTON · MASSACHUSETTS
A BIG PART IN INDUSTRY TOMORROW

Production Speeding Literature

(*Continued from page* 184)

AMERICAN MANGANESE STEEL DIV. American Brake Shoe & Foundry Co., Chicago, Heights, Ill.
Booklets: Amsco Alloy Heat Treating Containers; Maganese Steel Wheels and Rollers; Manganese Steel Chain for Elevating; Amsco Nagle Industrial Pumps.

DIVINE BROS. CO., Utica, N. Y.
Catalog No. 24; Truck Casters and Industrial Truck Wheels.

CARDOX CORP., Chicago, Ill.
Bulletins: Cardox Fire Extinguishing Systems; Quench Tanks; Airport Fire Truck.

GOODRICH CO., B. F., Akron, O.
Booklets: Rubber Conservation for Users of Industrial Rubber Belting; Care and Maintenance of Conveyor and Elevator Belting; How to Get the Most Out of Industrial Rubber Products.
Catalog Sections: No. 4500 Steam. Hose; No. 9700—Steel Jacketed Vulcalok Press Rolls.

GENERAL ELECTRIC CO., Schenectady, N. Y.
Manual: Motor Fitness Manual.
Booklets: How to Maintain D-C Motors; Fundamentals of Motors; How to Grease Ball-Bearing Motors by Means of the G-E Pressure-Relief System; How to Care for Motors; How to Avoid Overstress in Machine Parts; Electric Equipment for Aircraft Production; Electric Heaters and Heating Devices.

COOK ELECTRIC CO., Chicago, Ill.
Booklet: Cook Spring Life Metal Bellows, Cook Vapor Motor, Cook Bellows Switch.

R-S PRODUCTS CORP., Philadelphia, Pa.
Booklets: R-S Car Hearth Heat Treating Furnaces; R-S Butterfly Precision Machines and Wedge Tight Valves for regulation and shut-off duty for air, gas, liquids and semi-solids; R-S Butterfly Cast Steel Precision Valves.

TURNER BRASS WORKS, Sycamore, Ill.
Bulletins: Nos. 1 and 2, Turner Topics—Blow Torches, Lanterns, Fire Extinguisher, Soldering Coppers, etc.
Wall Chart: Know Your Blow Torch.

FELLOWS GEAR SHAPER CO., Springfield, Vt.
Circular: Flame Hardener.

ALVEY CONVEYOR MFG. CO., St. Louis, Mo.
Booklet: Winning the Battles of Production—Applications of Conveyors in War Production.

SELAS CO., Philadelphia, Pa.
Folder: No. 251-B—Superheat Burners.
Bulletins: 176-C—Automatic Fire Check; 610-B — Industrial Gas Equipment; Flame Hardening with City Gas.

FAIRBANKS, MORSE & CO., Chicago, Ill.
Bulletin: ELOOC—Catechism of Electrical Machinery—Theoretical and practical features of common types direct current and alternating current motors, generators and control equipment.

SURFACE COMBUSTION DIV., General Properties Co., Inc., Toledo, Ohio.
Booklets: Heating and Heat Treatment of Ordnance; Furnaces for National Defense; Wherever Heat is Used in the Production of Ships, Tanks and Planes; The A B C's of Prepared Atmospheres.
Folders: Forced Convection Furnaces; War Production with SC Heat Treating Furnaces; Annealing and Stress-Relieving of Cartridge Cases; Bombs and Projectiles; Gas-Fired Furnaces for Aircraft Industry; Rotary Hearth Furnaces; Roller Hearth Furnaces.

YOUNG RADIATOR CO., Racine, Wis.
Catalog No. 2942: Young "Vertivent" Heater and Ventilator.
Catalog Supplement No. 4540: Young Steam Distributing Tube Heat Transfer Units.
Folders: Young Aeronautical Heat Transfer Equipment; Heating, Cooling and Air Conditioning Units for Hangers, Airports, Factories, Laboratories, etc.

BULLDOG ELECTRIC PRODUCTS CO., Detroit, Mich.
Bulletin No. 427: Bulldog Bustribution Duct—Enclosed Busbar Method of electrical distribution for industrial plants and commercial buildings.

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Production Speeding Literature

(*Continued from page 340*)

DESPATCH OVEN CO., Minneapolis, Minn.
Bulletins: No. 31—Streamline Core Baking and Mold Drying Ovens; No. 81—Finish Baking and Drying Ovens for synthetic enamels, lacquers, varnishes, paints, etc.; No. 72—Convected Air Applications for Ovens, Dryers and Furnaces; No. 73—Convected Air Heat Efficiency; No. 74—Indirect Air Heaters—Gas and Oil; No. 81—Recirculating Furnaces; No. 83—Tempering and Drawing Furnaces — for tools, dies, precision parts, etc.

LOUDEN MACHINERY CO., Fairfield, Iowa.
Manual: Material Handling—Economical Material Handling Multiplies Man Power.

AJAX ELECTRIC CO., Inc., Philadelphia, Pa.
Folder: "Carburizing Gears in the Electric Salt Bath Furnace."

GLOBE HOIST CO., Philadelphia, Pa.
Catalog: Globe Powered Oil-Hydraulic Hoists for the Aviation Industry.

PORTABLE TOOLS

PRODUCT ENGINEERING CO., Los Angeles, Cal.
Catalog: Aircraft tools—Toggle Clamps, Drill Guide Pressure Foot, Drill Jig Bushings, Scribe Line Duplicators, Squeezer Sets, Dimpling Sets, etc.

STERLING TOOL PRODUCTS CO., Chicago, Ill.
Folder: Faster Production for War Industries—With Portable Sander.

NICHOLSON FILE CO., Providence, R. I.
Booklet: File Filosophy—and how to get the most out of files.

WHITNEY METAL OOL CO., Rockford, Ill.
Catalog No. 15: Whitney-Jensen Metal Working Tools; Whitney-Jensen Aircraft tools—prices, specifications.

AIRCRAFT TOOLS, INC., Los Angeles, Cal.
Catalog: Small Tools Especially Designed for Aircraft Production.

BLACK & DECKER MFG. CO., Towson, Md.
Booklets: The Portable Electric Drill; The Principles of Valve Reconditioning; Portable Electric Tools for Aircraft; Production and Maintenance; High Lights on High Cycle Super Power; Portable Electric Production Tools.
Data Book: Power Assembly Tools.

CUNNINGHAM CO., M. E., Pittsburgh, Pa.
Circulars: Safety Adjustable Hand Tool Holders; Safety Wedge Grip Stamps and Holders; Marking Equipment for Ammunition, Tanks, Guns, Gun Carriages, Etc.

DISSTON & SONS, INC., HENRY, Tacony, Philadelthia, Pa.
Conservation Control Cards: No. 3—Hank Hack Saw Blades; No. 10—General Information on Files; No. 12—Machinists' Files.

HANSEN MFG. CO., A. L., Chicago, Ill.
Catalog: Matthews Marking Devices.
Folder: Hansen One-Hand Tackers for Production of Airplane Plywood-Built Units.

KNU-VISE, INC., Detroit, Mich.
Catalog: Knu-Vise Toggle Action Clamping Tools.

MATTHEWS & CO., JAS. H., Philadelphia, Pa.

PREIS ENGRAVING MACHINE CO., H. P., Newark, N. J.
Folders: The Panto Utility Engraver—Electrical Market and Acid Etcher; The Panto Model CG.

STOW MFG. CO., Binghamton, N. Y.
Circular describing a new line of flexible drill shafts for use in aviation industry.

TUBING SEAL-CAP, INC., Los Angeles, Cal.
Brochure: "Torque Wrench"—Tubing and Pipe Protection Methods.

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Production Speeding Literature

(Continued from page 342)

WILLIAMS & CO., J. H., New York, N. Y.
Booklet: How to Select and Use Wrenches.
Data Sheets: How and Why Williams' Tools Air War Production.

COMPONENTS, PARTS & ACCESSORIES

GOODRICH CO., B. F., Akron, Ohio.
Booklet: De-Icer Handbook.
GOTHARD MFG. CO., Springfield, Ill.
Bulletin: Gothard Pilot Light Assemblies.
HARVEY MACHINE CO., Los Angeles, Cal.
Folder: Harvey Vulcan Preheater for Aircraft Engines.
HERCULES MOTORS CORP., Canton, Ohio.
Booklet: Description and Maintenance of Hercules Power Units.
HOOF PRODUCTS CO., Chicago, Ill.
Booklet: Everything Under Control with Hoof Governors.
INSTRUMENT SPECIALITIES CO., Inc., Little Falls, N. J.
Bulletin: Better Brush Springs.
LIPE-ROLLWAY CORP., Syracuse, N. Y.
Manual: Clutch Service Manual.
LYCOMING DIV., THE AVIATION CORP., Williamsport, Pa.
Descriptive Folders: Aircraft Engines; Light-Plane Engines; Horizontally opposed Aircraft Engines; The New GO-435 Service Geared 220 hp. Aircraft Engine; The Lycoming R-680-E Series Aviation Engine.
MILLS CORP., ELMER E., Chicago, Ill.
Folder: Mills Plastic Tubing and Fittings—types and applications.
NICE BALL BEARING CO., Nicetown, Philadelphia, Pa.
Booklet: Nice Ball Bearing Specifications for Aircraft Bearings.
PIERCE GOVERNOR CO., Anderson, Ind.
Booklet: Governors for Diesel Engines.
PUMP ENGINEERING SERVICE CORP., Div. of Borg-Warner, Cleveland, Ohio.
Service and Maintenance Manual: Pesco Standard Vacuum Pumps and Related Accessories.
Bulletin: Aircraft Products.
RAMSEY ACCESSORIES MFG. CORP., St. Louis, Mo.
Piston Ring Manual on Servicing Internal Combustion Engines.
THOMAS & BETTS CO., INC., Elizabeth, N. J.
Catalog No. 36: Electrical Connectors for Aircraft Wiring.
Booklet: No. 500 — Sta-Kon Pressure Terminals.
TITEFLEX METAL HOSE CO., Newark, N. J.
Catalogs: Flexible Metal Tubing; Radio Ignition Shielding.
Circular: All Metal Flexible Tubing for Industrial Applications.
AERO SCREW CO., Rockford, Ill.
Catalog No. 101: Aeroscrew Aircraft Hardware.
FRANCE PACKING CO., Tacony, Philadelphia, Pa.
Catalog: Metal Packing for Engines, Pumps and Compressors.
WHITE DENTAL MFG. CO., S. S., New York, N. Y.
Engineering Bulletins: Flexible Shafts for Remote Control; Flexible Shafts for Power Drives; How to Make the Most of Flexible Shafts; Choice and Application of Flexible Shafts in Aircraft.
CHICAGO MOLDED PRODUCTS CORP., Chicago, Ill.
Folder: Stock Knobs for War Industries—Plastics Molded Parts for automotive and other needs.
SKINNER PURIFIERS, INC., Detroit, Mich.
Catalog: Skinner Purifiers—for purification of fuel oils, lubricating oils, coolants, air, gases, etc.
ROPER CORP., GEORGE D., Rockford, Ill.
Bulletins: Hydraulically Balanced Pumps; Roper Rotary Pumps—for all types liquids, oils, alkaline solutions, etc.

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Production Speeding Literature

(Continued from page 344)

PUROLATOR CO., Newark, N. J.
Catalogs: Aviation—Oil Filters; Army Service Manual—Oil Filters; Sales and Service Catalog.
Folder: It's Our Duty to Conserve Oil and Engines.

NEW DEPARTURE DIV., General Motors Corp., Bristol, Conn.
Booklets: Details of Design — Bearing Shafts and Housings; Interchangeable Ball Bearings for Replacement.

ACCURATE SPRING MFG. CO., Chicago, Ill.
Handbook of Spring Data.

CINCH MFG. CORP., Chicago, Ill.
Catalog: "Cinch" Radio Parts.

FARREL-BIRMINGHAM CO., INC., Ansonia, Conn.
Booklet: Farrel Marine Gears in Action —Installation Details.

AHLBERG BEARING CO., Chicago, Ill.
Booklet: How Ball Bearings are Reconditioned.

UNITED STATES GAUGE CO., New York, N. Y.
Catalog: Aircraft Instruments.

WEATHERHEAD CO., Cleveland, Ohio.
Wall Chart—Illustrating Aviation Fittings, Hydraulic Hose, Valves and Other Aviation Accessories.

AIRCRAFT STANDARD PARTS CO., Rockford, Ill.
Catalog: Turnbuckles for Aircraft.

ARMSTRONG CORK CO., Lancaster, Pa.
Folder: Baskets, Packing and Seals.

DIAMOND CHAIN & MFG. C., Indianapolis, Ind.
Engineering Data Book No. 643: Aircraft Edition—on Diamond Precision Roller Chains and Sprockets for Aircraft.

CANNON ELECTRIC DEVELOPMENT CO., Los Angeles, Cal.
Manual: Cannon Plugs for Aircraft Electrical Circuits.

ANDERSON CO., Gary, Ind.
Manual: Rain-Master Sales and Service Manual.
Catalog Sections: Rain-Master Windshield Wiper Blades and Arms; Anco Army-Civilian Truck Special Windshield; Anco Army-Civilian Truck Special Windshield Wiper Blade.
shield Wiper Blade.

WISCONSIN MOTOR CORP., Milwaukee, Wis.
Booklet: Stepping Up the War Effort With Wisconsin.
Bulletins: 3 to 9 hp Heavy Duty Engines; 1 to 5 hp Heavy Duty Engines; Wisconsin V-E4 Engine.
Folder: How Wisconsin Heavy Duty Air-Cooled Engines Serve Industry.

SPRAGUE DEVICES, C. A., Michigan City, Ind.
Bulletin: Parts List and Service Directions for Jumbo Air-Push Window Wiper.

WESTON ELECTRICAL INSTRUMENT CORP., Newark, N. J.
Booklet: Electrical Aircraft Instruments ($.25).

CHAMPION AVIATION PRODUCTS CO., Los Angeles, Cal.
Handbooks: No. 10 — Wind Driven Generators; No. 11—Engine Driven Generators.
Folders: Aviation Starters and Generators; Engine Driven Generators for Aircraft—Descriptions and specifications.
Installation Sheets.

FANSTEEL METALLURGICAL CORP., North Chicago, Ill.
Booklet: Fansteel Electrical Contacts.

GENERAL ELECTRIC CO., Schnectady, N. Y.
Booklets: Control Devices for Aircraft Electric System; Specialty Transformers for Aircraft.

DUMORE CO., Racine, Wis.
Booklet: Dumore Aircraft Motors—How to Get Extra Power Hours in Aircraft Motors.

(Turn to page 348, please)

DAKAR—WEST AFRICA

400 Miles South of the Sahara

When our troops swung into Dakar, they found Layne Wells and Pumps on the job, producing millions of gallons of water daily. The Dakar installations had been made under the direction of Layne engineers and are identical with the famous high efficiency, long lasting Layne Wells and Pumps now serving your own local cities and industries.

Layne Wells and Pumps are in use throughout the African War Zone. They were chosen from a field of world wide competitive makes. The reasons for their selection are quite obvious: more skilfully designed, more ruggedly built and more efficient in operation. In war as in peace, their dependability has never faltered.

Tremendous quantities of well water is an absolute war necessity and today hundreds of speedily installed Layne Wells and Pumps are serving aircraft makers, ordnance works, munition factories, chemical plants, ship yards, flying fields, troop training areas and navy yards. Present production is now nearly 100 percent for the war needs, but every effort is being made to keep private and municipal installations in operation.

For literature, catalogs, folders, bulletins, etc., address LAYNE & BOWLER, INC., Memphis, Tenn.

LAYNE PUMPS & WELL WATER SYSTEMS

Affiliated Companies

Layne-Arkansas Company..........Stuttgart, Ark.
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Layne-Bowler New England Corp...Boston, Mass.
Layne-Central Company..........Memphis, Tenn.
Layne-Northern Company..........Mishawaka, Ind.
Layne-Louisiana Company......Lake Charles, La.
Louisiana Well Company..........Monroe, La.
Layne-New York Company..........New York City
Layne-Northwest Company......Milwaukee, Wis.
Layne-Ohio Company..........Columbus, Ohio
Layne-Texas Company..........Houston, Texas.
Layne-Western Company..........Kansas City, Mo.
Layne-Western Co. of Minn.....Minneapolis, Minn.
International Water Supply, Ltd...London, Ont.

WORLD'S LARGEST WATER DEVELOPERS

Production Speeding Literature

(Continued from page 346)

FUELS, LUBRICANTS & CUTTING OILS

STANDARD OIL CO. (Indiana), Chicago, Ill.
Booklet: Fluids and Facts for Metal Working.
Bulletins: Maintaining the Quality of Lubricants in Service; Trucks and Buses—Fuels and Lubricants.

HOUGHTON & CO., E. F., Philadelphia, Pa.
Booklet: Houghton Products for the Metal Industry.
Folders: Hydro-Drive MH Series of Hydraulic Oils; Dermatitis — Its Causes and Prevention in the Metal Working Industry.

ACHESON COLLOIDS CORP., Port Huron, Mich.
Bulletins: 421—Dag Collodial Graphite; 422—Dag Collodial Graphite as a Parting Compound.

COTTA TRANSMISSION CORP., Rockford, Ill.
Brochure: Stamina! Heavy Duty Transmissions.

STEWART-WARNER CORP., Chicago, Ill.
Catalog of Industrial Lubrication Equipment.

PETROLEUM ADVISERS, INC., New York, N. Y.
Booklets: Metal Cutting Lubrication; Diesel Engine Lubrication.
Circulars: Test Results of "Anti-Corode"; Anti-Corode.

SHELL OIL CO., New York, N. Y.
Booklets: Safe Handling of Aviation Gasoline; Panorama of Lubrication 1, The Fundamentals of Lubrication; 2, Lubricating Friction Type Bearings; 3, Golden Shell—The Balanced Oil; 4, The Fundamentals of Diesel Engine Lubrication; 5, The Fundamentals of Automotive Engine Lubrication; 6, The Fundamentals of Steam Engine Lubrication; 7, The Significance of Tests and Specifications; 8, Proper Handling of Lubricants.

FISKE BROS. REFINING CO., Newark, N. J.
Folders: Lubrication—The Prime Essential of Industry; No. 2-41—Now Who'll Lubricate It — A Service to Machinery Manufacturers that assures proper lubrication of machines in use; Lubrication of Ball & Rooler Bearings; Lubrication—Aviation's No. 1 Essential.
Bulletin No. 1-43: The Lubriplate Film.

FINISHES & FINISHING

IDEAL COMMUTATOR DRESSER CO., Sycamore, Ill.
Folder: Solderless—Tapeless Wire connectors for speed re-wiring and repair jobs.

FOSTORIA PRESSED STEEL CORP., Fostoria, O.
Catalogs: No. 27—Handbook of Lighting; No. 29—Near Infra-Red Process Equipment.
Circulars: No. 1142—Flashes; No. 1042—Flashes on Land, on Sea and in the Air; No. 942—Flashes; No. 742—Flashes, Anniversary Number.

BAKELITE CORP., Unit of Union Carbide and Carbon Corp., New York, N. Y.
Booklet: Bakelite Varnish, Enamel, Lacquer, Cement.
Folder: Technical Data—Bakelite Water Emulsions Based on C-9 Resins—Coating Products.

DITZLER COLOR CO., Detroit, Mich.
Book: Ditzler Repaint Manual ($.50).

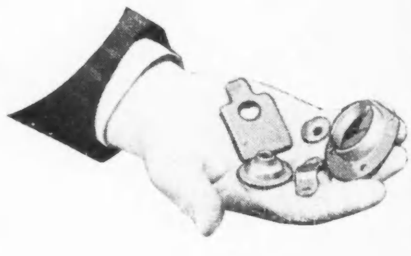
ECLIPSE AIR BRUSH CO., INC., Newark, N. J.
Booklet: Eclipse Spray Equipment on the Job—Examples of industry applications.

HERCULES POWDER CO., INC., Wilmington, Del.
Booklet: A Study of Pentalyn A and G Varnishes.

(Turn to page 350, please)

Serving *with* Stampings..

as small as these



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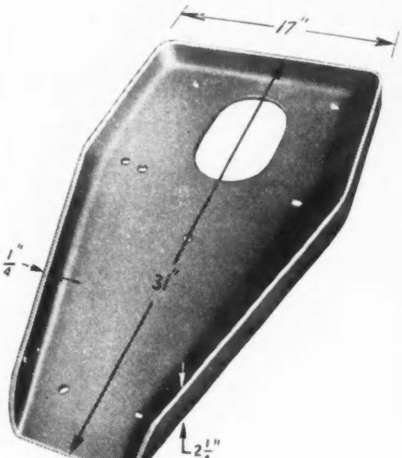

In addition to our wide range of stamping and drawing presses, our equipment includes auxiliary machinery, and a modern die room.

An opportunity to cooperate on your stamping requirements will receive prompt attention and the benefit of our 28 years of experience.

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LANSING, MICHIGAN

Production Speeding Literature

(Continued from page 348)

OSBORN MFG. CO., Cleveland, Ohio.
Descriptive Folder: Rotary Wire and Tampico Fibre Power Brushes and their Many Uses.

SHERWIN-WILLIAMS CO., Cleveland, Ohio.
Booklet: Color Standards — Holabird Ordnance Motor Base Specifications.

DIVINE BROS. CO., Utica, N. Y.
Catalog: Divine Polishing and Buffing Wheels.
Booklet: The Use and Treatment of Glue for Polishing ($.50).
Chart: Polishing Wheels.

NORTON CO., Worcester, Mass.
Booklet: Facts About Metal Polishing.

TESTOR CHEMICAL CO., Rockford, Ill.
Booklet: A Presentation of Testor Chemical Co. Ammunition Lacquers and Enamels, Ammunition Cements, Airplant Dopes.

BERRY BROS., INC., Detroit, Mich.
Booklet: Wings of Victory—Airplane Finishing.
Catalogs: Specifications for Aircraft Finishing—Fabric, Metal, Engine, Plywood Finishing, etc.

NORTH AMERICAN ELECTRIC LAMP CO., St. Louis, Mo.
Circulars: Radiant Energy: Using Infra-Red Baking; Technical Data on Wave Lengths, etc.; Baking Paint with Infrared Light; Nelco Dritherm Infra-Red Carbon Lamps.

MISCELLANEOUS

ELWELL-PARKER ELECTRIC CO., Cleveland, Ohio.
Booklet: Lady Will You Give a Lift?—Industrial Trucks, Tractors and Cranes.

MANBEE EQUIPMENT CO., INC., Chicago, Ill.
Manual: Tire Inspection.

MARMON-HERRINGTON CO., INC., Indianapolis, Ind.
Bulletins: All Wheel Drive for Heavy Duty Service; All Wheel Drive for Trucks, Commercial Cars and Passenger Cars.

TURCO PRODUCTS, INC., Los Angeles, Cal.
Booklet: Turco Procedure for Aircraft Engine Overhaul.

BRUNING CO., INC., CHARLES, Chicago, Ill.
Booklets: Index to New Printing and Developing Blueprints; Prints for Speed—Black and White Prints; The Pinacle of Speed in Printing and Developing.
Folders: High Volume in Small Floor Space Bruning 55 BW Printer.

GOODYEAR TIRE & RUBBER CO., Inc., Akron, Ohio.
Booklets: How to Make Your Tires Last Longer; How to Make Your Farm Tires Serve Longer; How Best to Protect Your Right to Drive; Premium Tire Performance.

CATERPILLAR TRACTOR CO., Peoria, Ill.
Booklet: Keep 'Em Working—How to get the most out of "Caterpillar" Tractor Equipment in War Service.

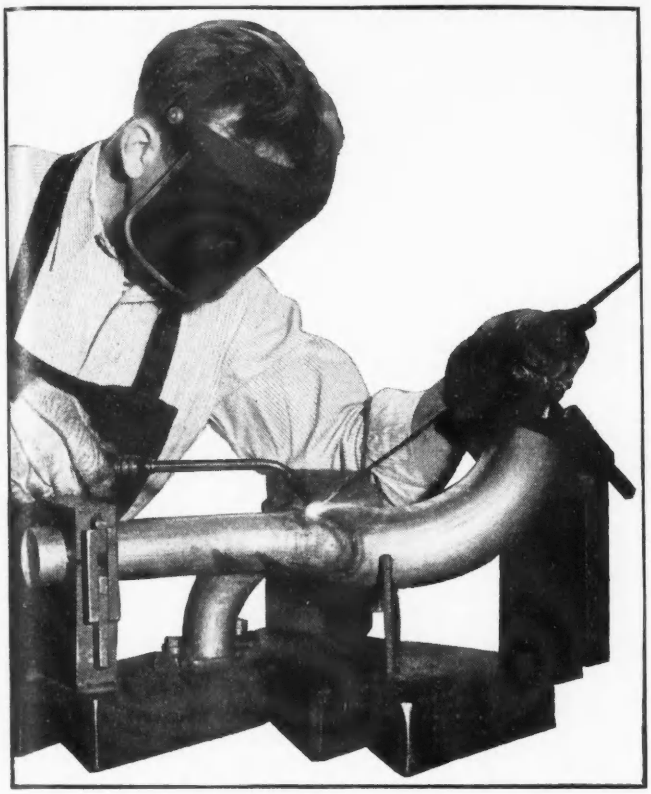
BLISS & LAUGHLIN, INC., Buffalo, N. Y.
Book: Cold Finished Bar Steels—Production Methods, Technical Data, Steel Data, Tables. ($2.00.)
Weight Calculator Chart.
Folders: Alloy Steels; Speed Ultra-Cut Stock; Ground Shafting; Cold Finished Steel Shafting.

METROPOLITAN LIFE INSURANCE CO., New York, N. Y.
Booklet: Controlling Factory Production—for Fuller use of Manpower and Machines.

GLOVE-UNION, INC., Milwaukee, Wis.
"Blackout" Bulletin: Storage Batteries.

WICKETT MOTOR SERVICE, Richmond, Ind.
Folders: Gemmer Full Forward Control Conversion Unit and Transit Type—Chassis Conversion.

(Turn to page 352, please)



SKILL COUNTS IN AIRCRAFT WELDING!

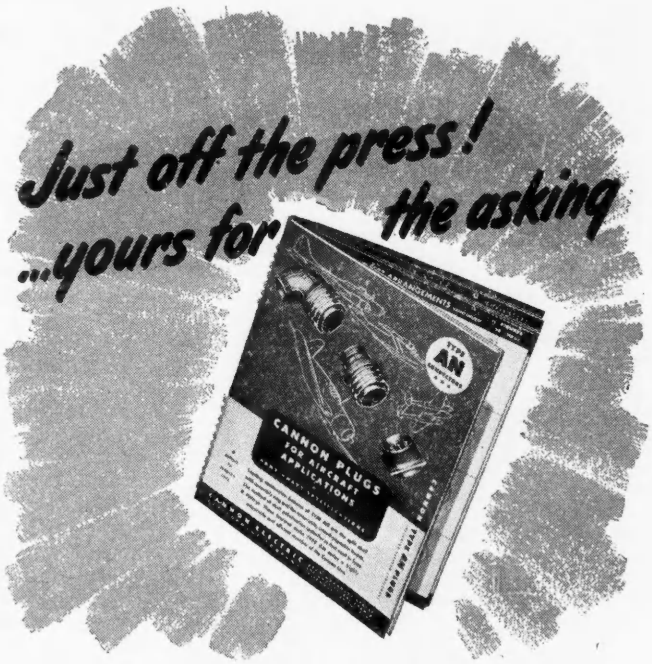
★ Organized more than five years ago for the sole purpose of serving the Army Air Forces, as well as the more prominent airplane manufacturing companies, this company is in an unique position since its entire personnel and experience have been used in the development of men and facilities for the production of airplane parts and assemblies. Welding technique, particularly, has been developed to a high degree, and through recent increases in facilities and personnel, *we are now ready to offer the welding experience of this company to a limited number of new customers.*

KAY PRODUCTS COMPANY

4825 CABOT STREET, DETROIT, MICHIGAN

DIVISION OF TYLER FIXTURE CORP., NILES, MICH.

AIRCRAFT WELDING



A COMPLETE UP-TO-DATE BULLETIN ON TYPE "AN" ELECTRICAL CONNECTORS

Here's the book the aircraft industry has been waiting for. The new bulletin on Cannon Type AN Connectors conforms to Army and Navy specifications AN9534a and AN-W-C-591. It is designed to facilitate selection and ordering of proper connectors for aircraft application.

The new "AN" brings for the first time a complete explanation of construction and operation of AN Plugs, together with a resumé of the development of AN Specifications. Everything right up-to-date.

There are 82 pages with ample illustrations... more than 40 photographs in the main bulletin, together with 167 insert arrangements and numerous outline sketches of assembly parts.

Indexed and set in clear, readable type... no cramped tabular material. Clearly marked dimensional data and sketches. Wire bound so that additional pages on AN Cable Clamps, Angle 90° Junction Shells, Dust Caps, Dummy or Stowage Receptacles and the new Cannon Bonding Ring may be inserted. A condensed catalog supplement included with the bulletin covers Types P, O, X, M, TQ, XK, and SS Fittings.

Send *now* for your copy of this authoritative Bulletin on Cannon AN Connectors. Address Department J, Cannon Electric Development Co.

FOR VICTORY BUY WAR BONDS AND STAMPS

CANNON ELECTRIC

Cannon Electric Development Co., Los Angeles, Calif.

Canadian Factory and Engineering Office:
Cannon Electric Company, Limited, Toronto, Canada

Representatives in principal cities — consult your local telephone book

Production Speeding Literature

(Continued from page 350)

FULLER MFG. CO., Kalamazoo, Mich.
Handbooks: Mechanics' and Drivers' Handbook.
Catalog: Fuller Transmissions.
Folders: Fuller Transmissions in Combination with the American Blower Hydraulic Coupling for Heavy Duty Truck Service.

WALKER MFG. CO., Racine, Wis.
Booklet: Care for Your Jack for Your Country.

GUIDE LAMP DIV., General Motors Detroit, Mich.
Guide: Servicing Headlamps Built Prior to 1940.

EDDY-RUCKER-NICKELS CO., Cambridge, Mass.
Work Incentive Posters: A set of 8 posters 17 x 22 ins. for plant use. (Price according to quantity ordered.)

Accident Prevention in Aircraft Manufacturing

(Continued from page 154)

The grinding, cutting, and sawing of magnesium parts have become a problem in the aircraft industry only recently. As you know, this material is highly flammable especially when it has been broken down into fine particles. Therefore, in order to work this material safely, special ventilation is required at point of operation. We recently purchased several specially manufactured water-washed air units for this purpose. The grindings are picked up at the point of operation, wetted and drawn into a container of water and kept submerged in water until cleaning time. These units must be ventilated to the outside to prevent gases produced by the action of water and magnesium from escaping into the workroom area. The sludge collected from these units should be buried or burned. People working with magnesium should not wear clothing that collects these fine grindings. In other words, no pants cuffs or exposed pockets should be worn, and employees should be careful to brush all material from their clothing before leaving the job.

Much more could be said about the processing of magnesium. However, times does not permit. The companies manufacturing this metal have quantities of material and are only too willing to supply it. There have been serious magnesium fires that have caused serious injury and death.

You no doubt have the same problem in the use of respirators as we; meaning, of course, the one of getting employees to use them faithfully. I believe there will be less need for them if more work is done on special ventilation for the hazardous operations.

Sometimes more should be said for personal protective safety equipment, since all aircraft companies on the Pacific Coast furnish this equipment

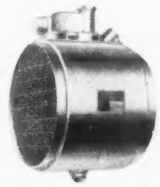
Young

HEAT TRANSFER EQUIPMENT

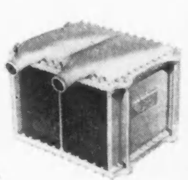
Sound engineering, correct designing . . . efficiency . . . durability . . . trouble-free performance . . . these are the noteworthy features of YOUNG Heat Transfer Equipment. Write for information on the complete YOUNG line, and consult with YOUNG engineers about your Heat Transfer problems.

FOR AVIATION

YOUNG Oil Temperature Regulators for "air-cooled" engines and YOUNG radiators for liquid cooled engines are standard equipment on Allied combat and training planes . . . a tribute to YOUNG engineering and manufacturing skill.



YOUNG OIL TEMPERATURE REGULATOR

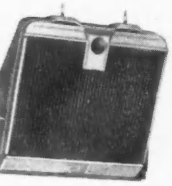


YOUNG LIQUID COOLANT RADIATOR

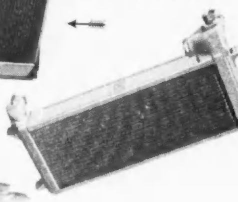
★

FOR ARMY USE

YOUNG Heat Transfer Equipment for Tanks, Half-tracks and Mobile Units is proving its worth under the stress and strain of active combat duty. Tank Oil Coolers are built with a patented tube and fin construction. Special slanted core, heavy-duty Scout Car Radiators are built to Army specifications.



YOUNG SLANTED CORE SCOUT CAR RADIATORS

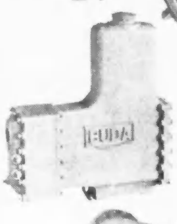


YOUNG ARMY TANK OIL COOLER

★

FOR MARINE USE

YOUNG engineers are specialists in designing and building Heat Transfer Equipment for marine installations. The Combination Oil Cooler, Heat Exchanger and Surge Tank illustrated is vital to shipboard fire fighting equipment. YOUNG Tube Bundle and Shell Heat Exchangers are available in all sizes and incorporate tested and tried construction features.



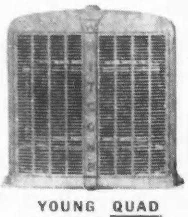
YOUNG COMBINATION OIL COOLER, HEAT EXCHANGER AND SURGE TANK.

YOUNG TUBE BUNDLE AND SHELL HEAT EXCHANGER.

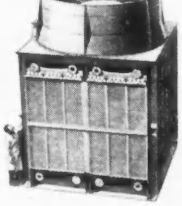
★

FOR LARGE DIESELS

Whether it is a heavy-duty radiator for a Diesel locomotive, or a new Quad (radiator-type) Cooling Tower, YOUNG Diesel cooling equipment has demonstrated its superiority and efficiency. YOUNG engineered Diesel cooling units are products of modern research and testing laboratories, a staff of engine specialists and complete manufacturing facilities.



YOUNG HEAVY DUTY DIESEL RADIATOR



YOUNG QUAD ATMOSPHERIC COOLING TOWER

YOUNG RADIATOR COMPANY

Dept. 213-CB, Racine, Wis., U. S. A.

Buy Bonds, Produce More, Salvage Scrap, Win the War.

Young

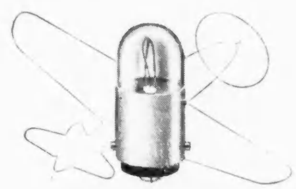
PRODUCT OF Young ENGINEERING AND MANUFACTURING SERVICE SPECIALIZING IN HEAT TRANSFER PRODUCTS

HEAT TRANSFER PRODUCTS

OIL COOLERS • GAS, GASOLINE, DIESEL ENGINE COOLING RADIATORS • INTERCOOLERS • HEAT EXCHANGERS • ENGINE JACKET WATER COOLERS • UNIT HEATERS • CONVECTORS • CONDENSORS • EVAPORATORS • AIR CONDITIONING UNITS • HEATING COILS • COOLING COILS

light TO DRIVE BY *light* TO FLY BY

In choosing its accessories, aviation selected products of proven merit. The recognized high quality of TUNG-SOL Lamps for 39 years in the automotive industry was aviation's assurance of dependability. You will find TUNG-SOL Lamps used on both Government and commercial planes throughout the world. Specify TUNG-SOL when ordering lamps.



TUNG-SOL AIRCRAFT LAMPS

TUNG-SOL LAMP WORKS INC., NEWARK, N. J., Sales Offices: ATLANTA, CHICAGO, DALLAS, DENVER, DETROIT, LOS ANGELES, NEW YORK, PHILADELPHIA.

ALSO MANUFACTURERS OF RADIO TUBES AND CURRENT INTERRUPTERS.

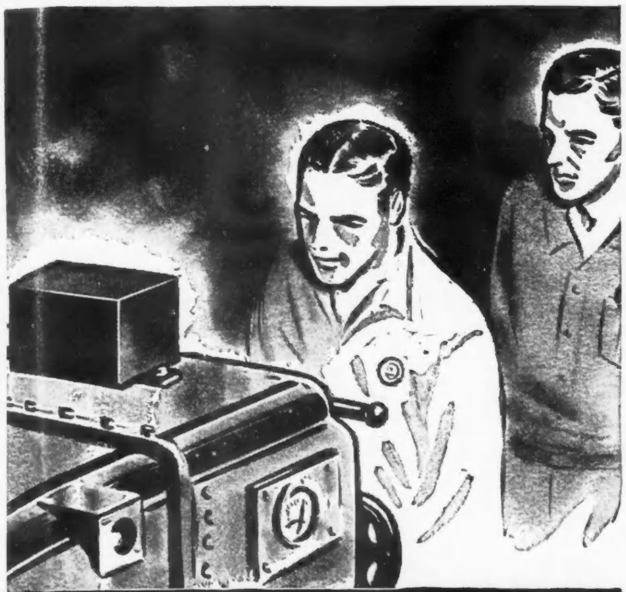
free of charge to their employees. Some of the items furnished for eye protection include safety glasses, clear and dark goggles, eye shields, welders' goggles, and hoods. Other items furnished are gloves of rubber, leather and leather face canvas back; aprons of canvas, leather and rubber; respirators, for the protection of employees from harmful fumes and dusts; hard hats where needed, both aluminum and fiber; safety belts where needed; protective creams for the prevention of skin diseases; and asbestos leggings for foundrymen. Safety shoes are sold at cost on a 50-cent a week payroll deduction plan. We feel that by making this equipment readily available and easily obtainable, we receive the finest co-operation from the employees when it comes to wearing this equipment.

In the past six months we have painted all the machines in several departments according to "three dimensionial seeing" plan and have had very favorable results, such as better housekeeping, increased visibility, better lighting results, more interest on the operators' parts in keeping the machine looking net and clean, and more attention paid to moving parts. Proper lighting, good wall color, neat and well-defined aisle lines, and the machines all newly painted give the employees a sense of responsibility to do a good, safe job.

When we first started to glue paper on plexiglas to prevent scratching while it was being handled in the shop, we built a dust-proof room to be used in placing the glue on the paper that was to be stuck on the plexiglas to prevent scratching. This room was also used as a drying room. We anticipated a certain amount of fumes and ventilated this area after a fashion. The reason for not bringing too much air in the room was to keep down as much dust as possible. We put two employees in this room doing the glueing job and after they had worked under these conditions for about three months their systems became saturated to the point that one day they both passed out. It took about four hours for one man to regain consciousness. Upon investigating the process, we found that the glue contained chloroform as a thinning and drying agent. The room was then adequately ventilated with filtered air and another room was added to apply the glue. The employees are not permitted to stay in the dying room any length of time.

This is only one of many examples that I could tell of if time permitted. I believe that we have climinated this trial and error method now because every process bulletin pertaining to acids, solvents, or alkalies that is written up by our company has in bold type at the bottom of the bulletin plainly visible to the user "See Safety Engineering Department for Instructions for Proper Personal Precautions." We also receive a copy of every process bulletin written and if, in due time, we have not been contacted by the shop in regard to the bulletin, we place a sign at the particular lcation giving the precautions that must be followed by employees. The supervisor or foreman is also informed of the dangers if these precautions are not enforced. This procedure has entirely prevented anyone from introducing processes without notifying the safety department.

We found recently, when classifying our lost-time accidents, that about ten per cent were eye cases. This percentage also held true in the first aid cases that reported to the dispensaries to have chips removed from their eyes. A year or so ago, this percentage was running almost 20 per cent, but some reduction has been made. I find in checking our industry that we lose from one to two eyes a year and I know that you, along with the rest of us, have tried almost every means to bring this condition to an end.



LOOK . . FOR THE LITTLE BLACK BOX!

We believe every good American wants above all to get this war won. Certainly that is the spirit here in the "Connecticut" plant. But postwar planning is as necessary to the business world as to government.

We do not believe tomorrow's world and yesterday's world have much in common.

We think that many of tomorrow's better things will come from "a little black box" containing automatic electric and electronic equipment. It will do much more than turn things on and off automatically at certain times — it will "look inside" materials being fabricated into finished products, "inspect" transportation equipment to be sure it is safe. It will improve communications amazingly.

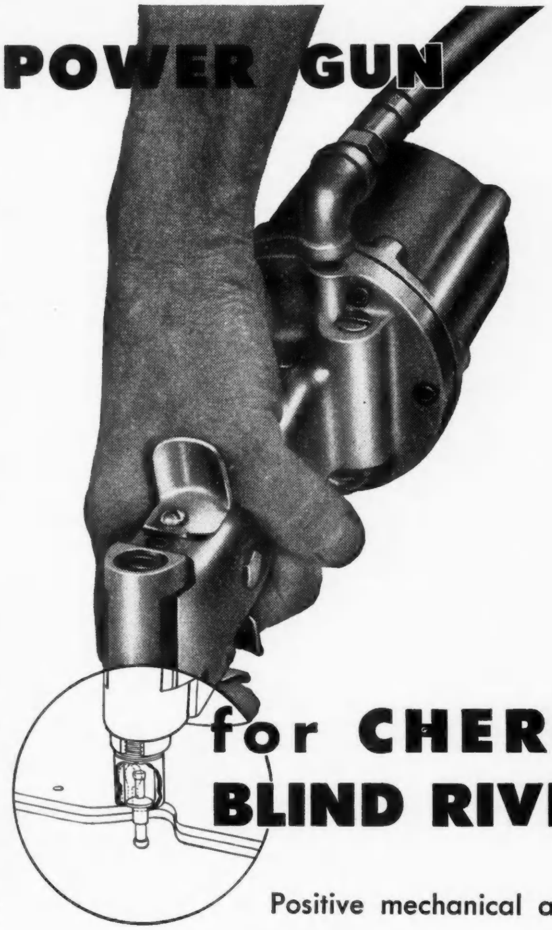
This "little black box" is not the invention of "Connecticut" or any other one company. It merely represents the practical application of advanced electrical and electronic principles, many of which are being learned from wartime development. "Connecticut" development engineers will have much to offer the manufacturer who would like to see the magic of "a little black box" applied to his product, or to machines in his plant.

CONNECTICUT TELEPHONE & ELECTRIC DIVISION

GREAT AMERICAN INDUSTRIES INC.

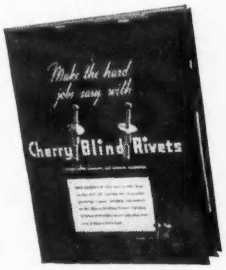
MERIDEN, CONNECTICUT

POWER GUN



for CHERRY BLIND RIVETS

Positive mechanical action is the most important single attribute to the successful operation of the Cherry Blind Rivet. Head formation and shank expansion are produced by a pulling force exerted on a mandrel passing through the rivet. A continuous pull may be applied by a pneumatic gun as shown above, or in field work, where air power is not available, a hand-operated gun may be used.



NEW HANDBOOK . . . a 16-page handbook of diagrams, dimensional sketches and photographs giving the complete story on the Cherry Riveting Process is available on request. Address Department 5, Cherry Rivet Co., Los Angeles, California.

CHERRY RIVETS, THEIR MANUFACTURE AND APPLICATION ARE COVERED BY U. S. PATENTS ISSUED AND PENDING.

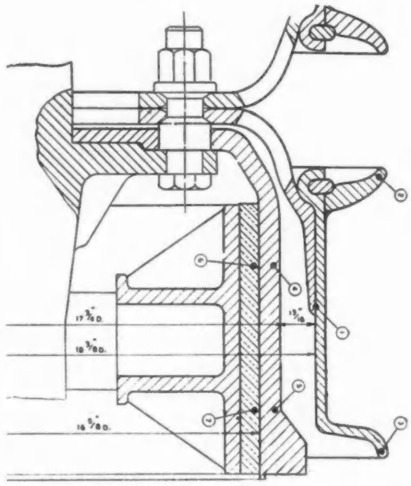
Cherry Rivet Company

LOS ANGELES, CALIFORNIA

Reducing Brake-Drum and Wheel-Rim Temperatures

Overheating of brake drums and wheel rims is an old problem in commercial-vehicle operation, and a research program to see what can be done to lower the temperatures of these parts has been carried through by the Institution of Automobile Engineers and was reported on in the December, 1942, issue of its *Journal*. Service measurements showed that high brake-drum and wheel-rim temperatures are confined to the rear-wheel assemblies. Brake-drum temperatures ranged as high as 390 F, and wheel-rim temperatures as high as 210 F under normal operating conditions. The highest temperatures were encountered in vehicles in which there was no engine braking, that is, in motor buses with hydraulic torque converters and in trolley buses. The conclusion was reached that the heat generated by braking is transferred to the wheel rims mainly by convection, and that the solution of the rim-cooling problem therefore lies in better ventilation.

The outstanding requirement is to improve the ventilation of the clearance space between the brake drum and the wheel rim. Twin-ventilated wheels are essential to good ventilation. In the laboratory the test ventilation was obtained with a combination of twin-ventilated wheels and a ring of eight radial vanes arranged transversely across the space between the wheel rims, the direction of air flow being from the open end of the brake drum toward the wheel apertures. These vanes, which were of light-gage sheet steel, each having an area of approximately 7 sq. in., were each fixed by a lug clamped between the wheel discs.



Section of modern bus wheel on which tests were made. The numbered dots indicate points at which thermocouples were located

Two other modifications which were shown to be beneficial in the laboratory are already accepted in practice, viz., securing the brake drum to the outer side of the flange on the wheel hub, and use of brake drums of smaller diameter, to obtain a wider clearance space. This increase in the width of the clearance space should be accompanied by an adequate area between the drum flange and the wheel rim. In wheels of recent design the wheel studs are so arranged that there is a gap between the inner wheel and the brake drum. Experiments were made also with the transversely finned brake drums, and these gave the lowest drum temperatures in the laboratory and reduced rim temperatures to acceptable levels, but there is some question as to their practicability under service conditions.